MODEL AIRPLANE NEWS

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THE WORLD'S PREMIER R/C MODELING MAGAZINE

48120

April 1996

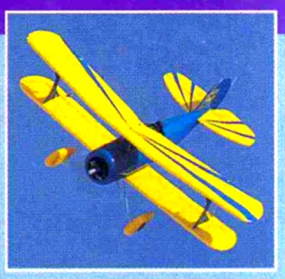
60 ALMOST-READY-TO-COVER KITS

ARC PRODUCT GUIDE

PRICES SPECS & MORE

—see page 60

Model Tech ARC GREAT LAKES BIPE



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TOP FLITE GOLD EDITION P-40E WARHAWK

WW I SCALE

—see page 138

FTERBURNER ACTION!

UPERMAN JET RALLY

SCALE TECHNIQUES FROM A MASTER!

Hawker Tempest

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EVIEWS—

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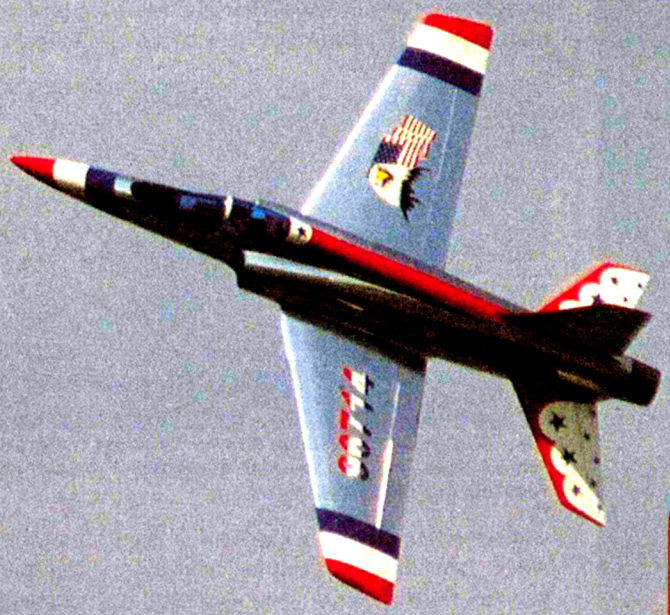
features

construction

columns



reviews

departments

ON THE COVER (top to bottom): the new Model Tech Great Lakes ARC bipe (photo by Walter Sidas); Top Flite's Gold Edition P-40E Warhawk (photo by Walter Sidas); Tom Polapink's Albatros cockpit (photo by Frank Gudaitis); Sepp Uiberlacher's award-winning Hawker Tempest (photo by Mike Cherry) and an F-86 Sabre jet from the Superman Jet Rally (photo by Rich Uravitch).

ABOVE: flown by Terry Nitsch, this BVM Maverick Pro is caught part way in a slow roll (photo by Rich Uravitch).

EDITORIAL

by GERRY YARRISH

ARC PRODUCT GUIDE

Modelers are modelers regardless of how much time they spend at the workbench. In a world in which there is less and less free time to enjoy hobbies, who can argue against models that take hours instead of weeks to build and get you to the flying field? As we all know, almost-ready-to-cover (ARC) models grew out of the earlier almost-ready-to-fly (ARF) market, and they have a very appealing attribute not present in the ARFs. That attribute is their individuality; you can finish them the way you want. Whether you build a trainer, a sport-pattern model, or a scale aerobat, you can make that ARC *your* way.

In this issue, we have a comprehensive product guide of 60 of the most popular ARC models on the market, and it includes prices and specifications. Swap that building time for air time, and enjoy the new flying season with a one-of-a-kind beauty.

TRIUMPHANT TEMPEST

Also in this issue, we have a new, special addition called "In Focus." A couple of times a year, we will highlight unique and incredible models and the modelers who build them. This time, we have Sepp Uiberlacher and his wonderful Hawker Tempest with which he won the 1995 Top Gun High Static Score in Expert and the Best Craftsmanship Award. Written by Mike Cherry of England, this article focuses on Sepp's truly amazing craftsmanship and love of the art of scale.

THE VOTES ARE IN

The winners of the 1995 Pilots' Projects have been chosen. As always, it was very hard to pick the winners from all the great entries we received last year. We are constantly amazed at the beautiful, unique entries our readers send in. If you didn't get picked this year, don't despair; try again in '96.

IT'S A BIRD, IT'S A PLANE...

No; it's the 7th Annual Superman Jet Rally! Brought to you by our mild-mannered reporter Rich Uravitch, straight from the home of Superman—Metropolis, IL. Sponsored by Horizon Hobby Distributors and *Model Airplane News,* the Superman Fan Rally is quickly becoming one of the premier jet events in the country. Rich lets us in on what's happening on the cutting edge of jet technology—everything from exotic kerosene-burning turbine engines to true ARF, ducted-fan kits.

Sepp Uiberlacher's fabulous Hawker Tempest is the subject of our new department, "In Focus." Sepp won both the High Static Score (expert) and Best Craftmanship award at the 1995 Top Gun Scale Invitational.

SADDLE UP FOR A MUSTANG

And not just any P-51! This D-version thoroughbred was designed by Dan Santich for giant-scale Unlimited racing, but it will be just as comfortable at any IMAA warbird fly-in. Because of its conventional construction techniques, wood builders will find the model a snap (a big snap) to build. To make the task even easier, items such as the canopy and the engine cowl are available from Nick Ziroli Models. Whether you're a Chuck Yeager or a Bob Hoover type, Dan's P-51 is sure to fill that giant soft spot in your Mustang heart. Enjoy.

MODEL AIRPLANE NEWS

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INTERNET *man@airage.com*

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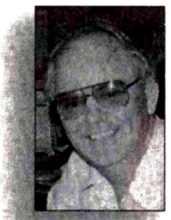
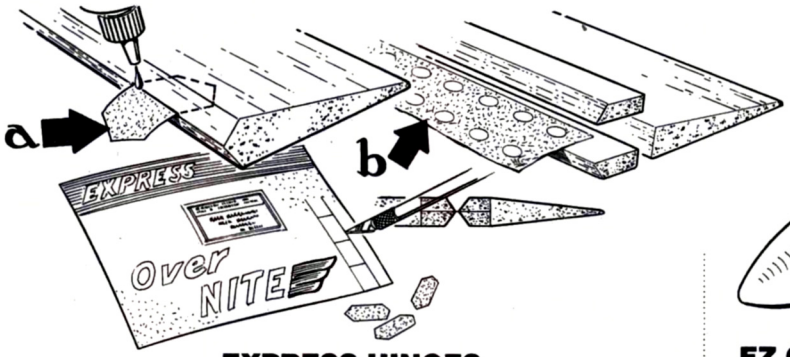


Hints & KINKS

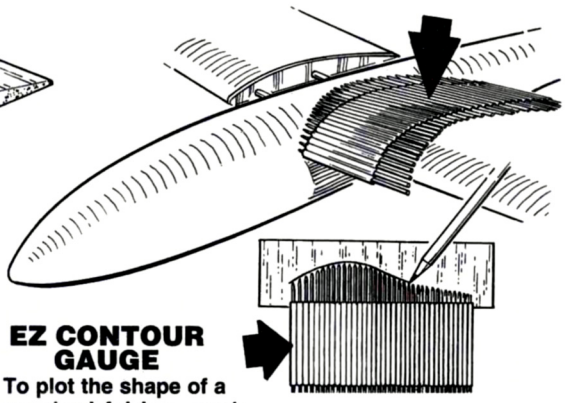
by JIM NEWMAN

Model Airplane News will give a free one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o Model Airplane News, 251 Danbury Rd., Wilton, CT 06897-3035. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.



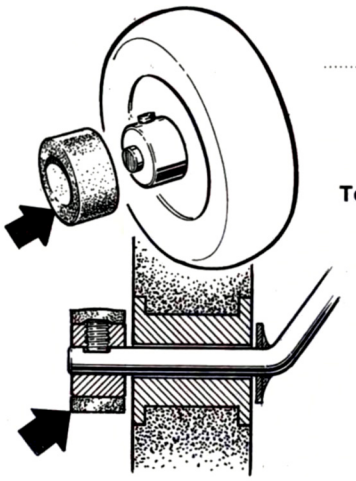
EXPRESS HINGES

Tough, light, flexible hinges can be cut out of Tyvek® express-mail envelopes. Insert them into a knife slit (a), squeeze the wood to close the slit, then wick in thin CA. Also shown is a long, continuous strip hinge (b) that seals the hinge gap. Punch holes, apply thick CA across the holes, then press the wooden strips together. ***Tobias Feltus, Assisi, Italy***



EZ CONTOUR GAUGE

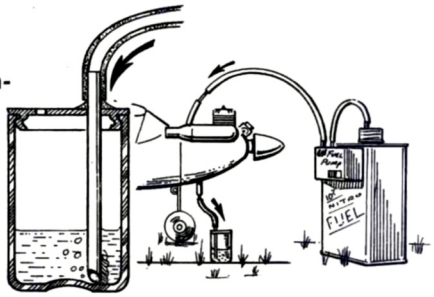
To plot the shape of a required fairing, push drinking straws or bamboo skewers into the flutes of corrugated card that has been laid across a wing. Create the fairing on sheet balsa by tracing around the tops of the skewers. ***Fred Walker, Oldham, Lancs., England***



CAPTIVE SETSCREWS

To prevent a setscrew from "backing out," tighten it, then stretch a section of rubber fuel line over the wheel collar.

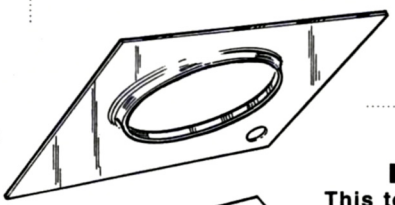
John Gustafson, Somerville, AL



OVERFLOW COLLECTOR

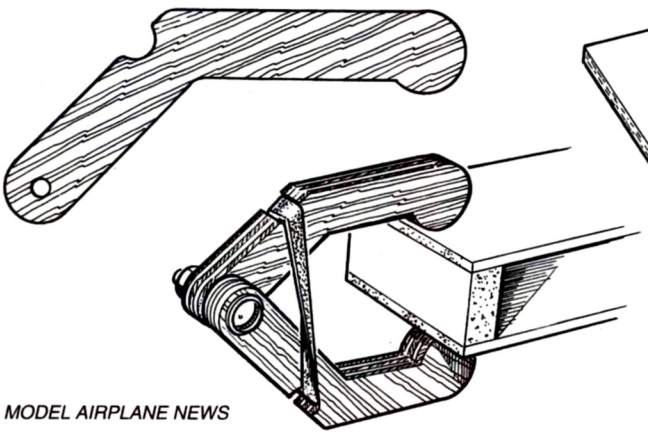
To protect the environment, catch all fuel overflow with a transparent Fuji film canister that has Nyrod glued into it with PFM or Goop. (Some fliers may prefer a 4- to 6-ounce container.) Pour the fuel back into the jug at the end of the flying session. Note the tiny vent hole in the cap.

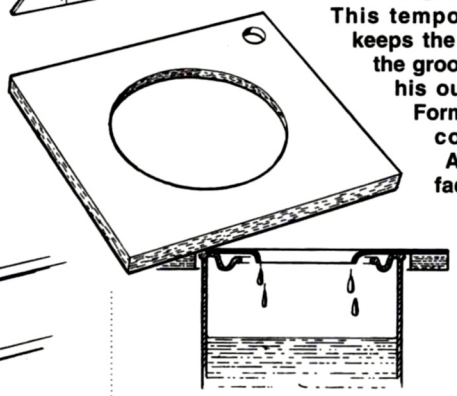
Bob Butterworth, Burlington, Ontario, Canada



ZERO DOLLAR CLAMPS

Cut two arms out of thick plywood remnants, then add a pivot screw and a couple of rubber bands to make these useful clamps. ***Laurence Mingle, USS Boxer, FPO***





NO-MESS CAN TOP

This temporary paint-can drip cover keeps the drips in the can and out of the groove around the top. Jay made his out of 1/4-inch Masonite® and Formica® laminated together. The corner hole is for hanging. Another version uses a top facing of soft aluminum flashing with a turned-down lip that's burnished around the edge to shed the drips. Both work well.

Jay Wilcox, Ashland, OR

AIRWAVES

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News,** 251 Danbury Road, Wilton, CT 06897-3035; e-mail: man@airage.com. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we can not respond to every one.

Editor's note: the article "Understanding How Models [Really] Fly" by Jef Raskin that appeared in our January 1996 issue has generated a tremendous amount of mail. We would like to thank all our readers who wrote to us with their comments both agreeing and disagreeing with Jef. Here are some of the most interesting letters we received.

INSPIRED STUDENT

My name is Ryan Dias and I am a 12th-grade student in Newfoundland, Canada. I read your article on the Coanda effect and was intrigued. I have always asked myself how a symmetrical foil worked and how a plane could fly inverted. Thank you very much for answering my questions.

I am looking for a science-fair topic for this year, and I think this subject has potential. If you could refer me to any books or other material to find out all I can, I would appreciate it greatly. Also any other experiments you can suggest would be greatly helpful (I am looking for a scholarship to a university). I built a miniature wind tunnel in 1994 and a miniature water tunnel in 1995 (which won me a one-year scholarship).

RYAN DIAS
rdias@newcomm.net

Ryan, thank you for your e-mail about my article. As for references, I have written a longer article on this subject, at a high-school level. Here's the reference: Raskin, J., "Physics of Flight," Quantum, September/October 1994, page 5. Your library should be able to get you a copy to look at.

A very good book on how model planes fly that is both accurate and well-written is Model Aircraft Aerodynamics by Martin Simons. Any bookstore should be able to order it.

Any good college physics textbook will explain the correct way to apply Bernoulli's equation and should not be too difficult for a scholarship winner such as you. I haven't seen any articles or books that present lift and drag as I have, and that is why I felt I had to write it.

JEF RASKIN
Jef Raskin@aol.com

SIMPLIFIED FACTS

The author's attempt to debunk the Bernoulli theory and proclaim the Coanda theory as being the prime means of producing lift via a wing is a classic example of narrow oversimplification. First, he neglects to mention that Bernoulli's theory was and is about the action of a fluid in a venturi. Those who seek to explain lift do so by assuming that the airfoil is one half a venturi and that the other half is a cushion of air a distance above the airfoil. It is true that as the fluid passes through the venturi it speeds up and loses pressure. In the case of the airfoil, because the opposite side of the venturi is not present, the airfoil is moved upward—this we call "lift." The rest of the story: (completely neglected by Mr. Raskin) a very large component of the lift generated by an airfoil is influenced by the angle of incidence that the airfoil presents to the air as it moves through it. Does Mr. Raskin realize you can fly a barn door given enough power?

Incidentally, I was aware of these theories in grammar school years at age 12. I, too, found some teachers unable to convince their students on occasion. But I did not disrupt the class and try to demonstrate my "superior knowledge." Instead, I listened and learned!

WALTER H. DIEM
Port St. Lucie, FL

MANY THANKS

Thank you, thank you! Some good writing on a subject of much confusion in my life. Admittedly, I have never researched or experimented with how a wing generates lift other than the ordinary blow-over-the-paper routine and by building and flying model aircraft. Your article, however, puts to rest my nagging intuition that has been telling me that there has to be more to the creation of lift by airfoils than what I have previously read or been told. My curiosity and interest have been reawakened.

RICHARD A. DEVERSE
deverse@hawaii.edu

ENOUGH IS...

...enough! The revisionist attacks must stop. I cannot sit idly by without commenting on the article "Understanding How Models [Really] Fly" in the January 1996 issue of *Model Airplane News*.

1. The common explanation for how lift is produced by an airfoil is not by applying the Bernoulli equation, which is erroneously used in the reference article side-

bar, but by the factual and almost universally accepted explanation of the pressure differential across the lifting surface (flat plate, airfoil, lifting body, etc.). The pressure-differential explanation is supported by extensive wind-tunnel force and pressure model tests on "two-dimensional" and finite span airfoil/aircraft lifting surfaces and bodies.

2. Most professional aerodynamicists and structural-loads engineers who are involved with military and/or large commercial aircraft development rely on pressure and force data from model tests in the design process.

3. Airfoil and three-dimensional lift, drag and pitching-moment coefficients can be calculated by several theoretical methods; however, test data are frequently obtained to validate such calculations. Pressure measurements on lower and upper surfaces are differenced (Pl – Pu) at common chordwise locations to obtain ΔP (delta P) values. Chordwise integration of the resulting ΔP values divided by q (q = free-stream dynamic pressure) gives the section lift coefficient C_L with other integrations resulting in drag and pitching-moment coefficients for the particular test condition (angle of attack, Mach number, etc.). It is common practice to correlate *these* pressure data with those resulting from force measurements.

4. As to the reference article's explanation (the Coanda effect), it should be understood that this is nothing more than the "Momentum Theory of Airfoils" (F = MΔV)—Newton's Law—wherein Δ is the vector change of velocity of the fluid stream and M is the mass of the fluid deflected per unit of time. This theory has been around for many years, as has the "Circulation Theory of Airfoils"—reference "Technical Aerodynamics" by K.D. Wood, second edition, 1947. Neither of these theories directly addresses pressures as such; however, both provide reasonable agreement with pressure measurements.

5. My experience supports the above statements based on over 30 years as a professional aero engineer dealing in loads-and-dynamics design requirements for full-scale transport aircraft.

6. Mr. Raskin is not the only person to dismiss or otherwise attempt to discount the "pressure differential" explanation of aerodynamic forces (a columnist in another model magazine continues to explain lift by other means).

THOMAS E. DISNEY
AMA 11331

I have received dozens of letters about my article "Understanding How Models Fly." I am grateful to find that my explanation proved valuable to most correspondents. Reader appreciation is the most important reward a writer can get.

A number of letters showed that though I said explicitly that "Bernoulli's equation is correct" (page 70), I failed to convey this point with sufficient force. You certainly can calculate the lift on a wing by using Bernoulli's equations on the actual air velocities; however, finding those velocities is neither trivial nor intuitive, and calculating the lift involves calculus, a subject that does not come easily to everybody.

When I spoke of the "common explanation" of lift, I was referring to the explanation of lift that I've heard from flying instructors and modelers—the explanation repeatedly found in elementary books and popular magazines. It goes like this:

"Two molecules of air that separate at the leading edge of an airfoil rejoin at the trailing edge. Since the top of the wing is curved, the molecule on top has to go farther in the same time; thus it goes faster. By Bernoulli's equation, the pressure on top is lower and this is what lifts the plane."

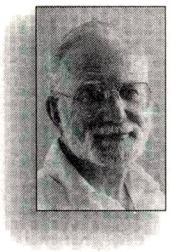
This explanation is, as I showed in the article, both conceptually and numerically wrong. In fact, it starts from an incorrect premise, because the air molecule on top of a lifting wing gets to the trailing edge well before the one on the bottom, as smoke-puff experiments in wind tunnels demonstrate.

Mr. Diem's letter somewhat misses the point of the article and he seems not to have read it carefully. He says I attempt to "debunk the Bernoulli theory," when I said the exact opposite. He also says that "Bernoulli's theory was and is about the action of a fluid in a venturi." Not so! In Daniel Bernoulli's 1738 book, Hydrodynamica, he derives his equations from the flow through a pipe of constant diameter, not a venturi. But the modern form of the law, which relates the square of the velocity of a fluid inversely to the pressure it exerts perpendicular to its motion, is actually due to Lagrange, who derived it by integrating Euler's equations of motion. When Diem says that I "completely neglected" the angle of incidence (he meant "angle of attack"), I suspect that he missed the section on page 73 where I said that "the angle of attack...is crucially important to a symmetrical airfoil." He wonders whether I realize that you can fly a barn door with enough power. If the door is built well, of course you can, and my article mentioned two cases in which wings as flat as barn doors generated lift.

In Mr. Disney's letter, the second paragraph explicitly changes the meaning of "the common explanation." He is entirely correct (except about me being a "revisionist") if you use his definition instead of mine. However, this also means that he is not critiquing my article but a construction of his own.

In the experiment where you blow across a concave strip, I said, "This strip will move up when you blow across it, even though there must be less pressure on the top." Reader Max Feil has pointed out that I made two errors—one is the typo of "up" for "down" (the caption on the illustration was correct). More important, he notes that I should have said that only the common and incorrect application of Bernoulli's principle predicts that there must be less pressure on the top. I am grateful for Mr. Feil's corrections.

As I have emphasized, the pressure approach is not wrong, but it is mighty hard to apply, ignores drag and can confuse even Nobel laureate physicists. On the other hand, keeping the Coanda effect in mind makes it far easier to get a "feel" for the effects aircraft and airfoil shapes are likely to have, and, therefore, it is a better mental model for most of us to use when designing and flying model planes. *Jef Raskin*

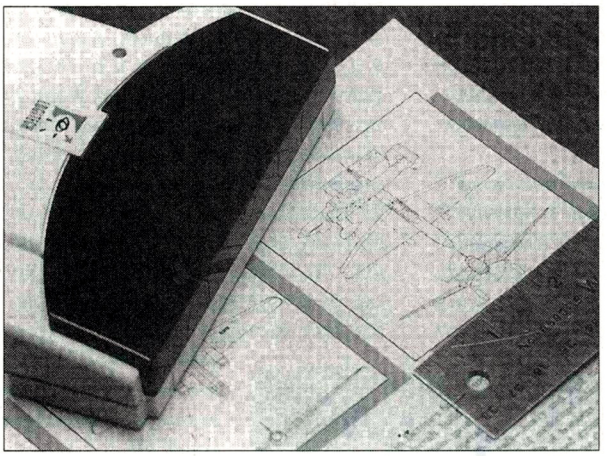


How TO:

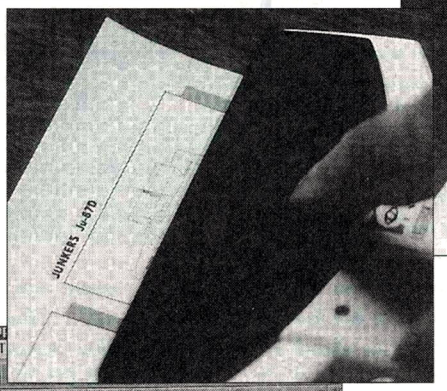
by RANDY RANDOLPH

ENLARGE 3-VIEWS

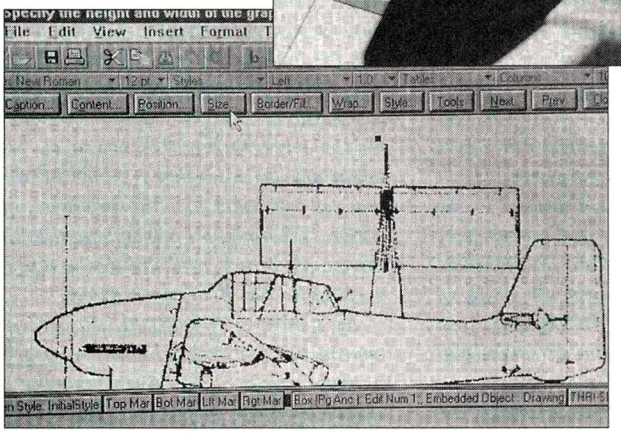
SCRATCH-BUILDERS are always looking for something new to build, and 3-views from various aviation publications can provide the basis for that next idea. The popularity of PCs and inexpensive hand scanners has made the job of enlarging 3-views not only fun, but also very helpful when creating working plans. A PC, a scanner and a word-processing program that includes graphics will do the trick.



1 You can find 3-view drawings in model and full-scale aviation magazines, advertising brochures, historical and military publications and many history books. Three inches square seems to be a popular format, and it's one that is difficult to enlarge on copy machines.

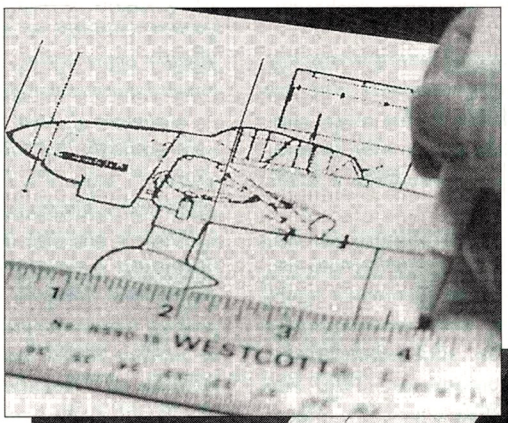


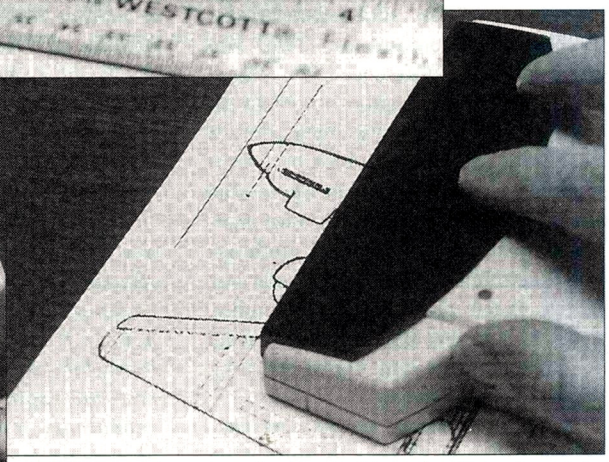
2 First, scan the 3-view into the computer. Most scanner software offers a variety of scanning options, so choose the one that provides the easiest access to the drawing. Set the scanner for line drawings.



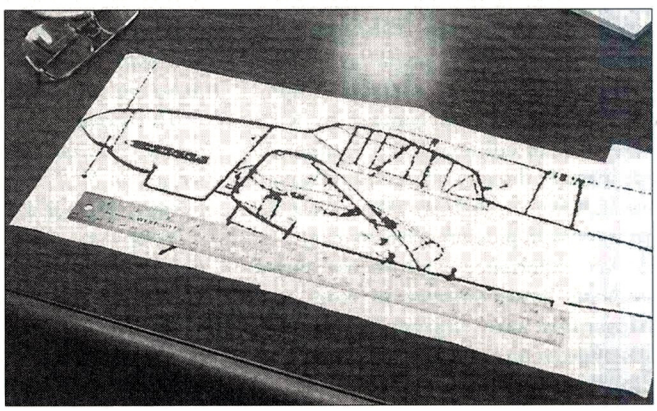
3 Edit the drawing to make the desired component the dominant object of the scan (in this case, the fuselage), and enlarge it to the largest size allowed by the paper size in your printer. Landscape orientation of the page allows the widest part of a standard 8½x11-inch sheet to be used.

4 Print the scan, then divide it into 2-inch segments. Draw heavy, black, vertical lines at each 2-inch increment. This allows a standard scan width so that all segments can be enlarged the same amount.

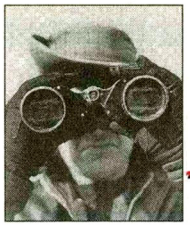




5 Scan each segment separately, and edit each one to the width of the two black lines. Enlarge each segment to a selected size (in this case, 6 inches to produce a drawing three times the size of the print), and print each segment separately.



6 Trim each segment to the left black line, and glue them together to produce a finished, enlarged plan view of the original 3-view drawing. The other component parts, such as the wing, stab and front views, can be enlarged the same way.



AirSCOOP

by CHRIS CHIANELLI

New products or people behind the scenes; my sources have been put on alert to get the scoop! In this column, you'll find new things that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares? It's you, the reader, who matters most! I spy for those who fly!

JR'S XP783

For many years, JR's X-347 7-channel radio has been very popular with airplane, helicopter and sailplane pilots. JR's new XP783 radio, which replaces the X-347, is less expensive, has seven channels and eight-model memory, and it's also available in two versions (aircraft and heli). Both have the same programming features, but the transmitter switches are positioned to suit aircraft or heli flying. New up-grades on the XP783 include: trim memory; six programmable mixes; trim include and include mixing; aileron differential for airplanes; stunt trim; hold rudder offset; auto dual rate; two programmable mixes for helis; a programmable 3-position switch; six programmable mixes; user-selectable switches for all mixes; full trailing-edge mixing and preset capabilities; butterfly/crow mixing; and dual flap trim for gliders, to name just a few.

• Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511; fax (217) 355-8734.

ZIROLI THUNDER

New from the Nick Ziroli drawing board is this great-looking P-47 Thunderbolt, which is shown here with builder Greg Hahn. The Jug is reproduced in 1/5 scale and is available in the C, D and N versions. The 79-inch-long, 92-inch-span model sports 1,500 square inches of wing area and takes a 3.7 to 5.2ci gas engine, and its finished weight is between 30 and 35 pounds. Plans and accessories are now available.

• Nick Ziroli Plans, 29 Edgar Dr., Smithtown, NY 11787; (516) 467-4765; fax (516) 467-1752.

Magnum Muscle

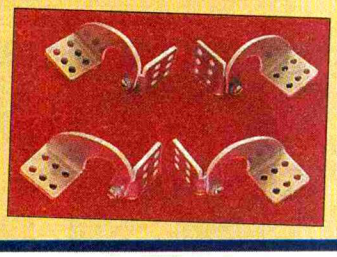
With the introduction of their XL .61A and the XL .61AR, Global's arsenal of Magnum 2-stroke glow engines has grown. The .61A is a ball-bearing-supported, ABC engine while the .61AR is a ringed-piston type—a new step for Magnum. Both have the latest Magnum dual-needle carburetor. These new engines are said to idle nicely at around 2,000rpm and reach a peak of more than 12,000rpm using props and mufflers of standard size. According to Global's president, Paul Bender, "These value-priced engines give great performance and long life in an affordable package."

The AR version runs very smoothly and transitions better than any .61 Magnum has ever made.

• Magnum; distributed by Global Hobby Distributors, 10725 Ellis Ave., Fountain Valley, CA 92728-8610; (714) 963-0133; fax (714) 962-6452.

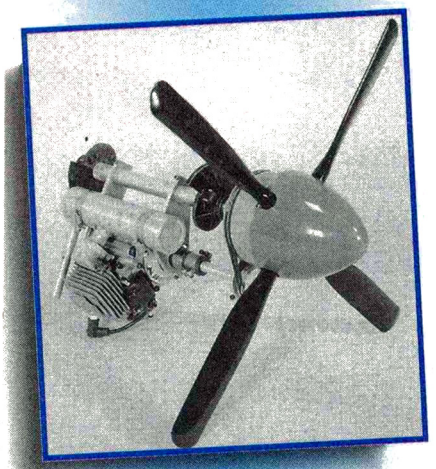
ROBART Door Hinges

Robart announces that, in April '96, they will introduce a new line of large-scale gear-door hinges. Made of metal and featuring pivot bushings, the hinges include 2-56 screws and aluminum locknuts. These new hinges are strong and light. Designed for easy installation, they're perfect for landing-gear doors, bomb-bay doors, hatches and panels, and they can be used on R/C models of all sizes, including aircraft, boats and helicopters. Packages include two sets of hinges and a helpful installation diagram. Price will be announced soon, but like all Robart products, they should be a great value.



• Robart Mfg., P.O. Box 1247, St. Charles, IL 60174; (708) 584-7616; fax (708) 584-3712.

A MUSTANG-POWERED MUSTANG?



Byron Originals has just come up with what might be the ultimate powerplant for their tried-and-true P-51 Mustang: the new Mustang 50 gas engine coupled to the Byron 4-blade reduction drive prop system. The Mustang 50 unloads unlike any other engine Byron has tested with their reduction drive unit. Thanks to the Mustang 50, the reduction drive runs as smooth as silk, and the PurrrPow'r muffler gives it a sound almost like the real thing. The new power system (including engine) weighs 10 pounds, 6 ounces. Its 2.5:1 reduction ratio turns a 4-blade, 24x15 prop and produces a static thrust of 22.5 pounds at 3,400rpm. Older reduction drives can be retrofitted with the Mustang 50 engine.

• Byron Originals, P.O. Box 279, Ida Grove, IA 51445; (712) 364-3165; fax (712) 364-3901.

A CELEBRATION OF EAGLES

NATS '96

This July 6th and 7th, the greatest names in modeling past and present will meet in Muncie on the eve of Nats '96. They're coming to swap remembrances with old friends..., to fly in the vintage Free Flight, Vintage Control Line, and Vintage RC events.They're coming to celebrate AMA's 60th anniversary and to meet you!

Saturday, July 6th: a full day of Vintage Control Line and Vintage Free Flight flying, followed by a major reception at the Frank V. Ehling National Model Aviation Museum.

Sunday, July 7th: a full day of Vintage Control Line, Vintage Free Flight and Vintage RC, followed by a "Gathering of the Clan" banquet. Nats '96 registration begins.

Area hotels offer special AMA rates. Or, if you act fast, you can stay in the new dorm at Ball State University. Each room sleeps two and shares a bath with the adjoining room. Take your choice of single or double occupancy... both well under $30 per person. If you decide to stay more than four nights, the rest of the seven-day week is free!

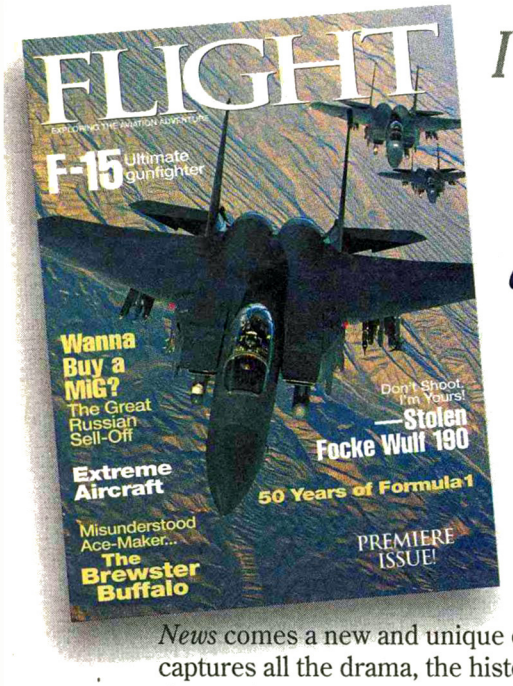
Nats '96 marks AMA's 70th National Aeromodeling Championships... the first All-Muncie Nats. It's a memory-packed, never-to-be-forgotten experience...your chance to meet and (if you like) compete with the best builders and flyers in our sport. After 5:00 pm, fly for sheer enjoyment at your AMA thousand acre plus flying site.

For more information, call or write **"A Celebration of Eagles", Academy of Model Aeronautics, 5151 East Memorial Drive, Muncie, IN 47302. (317) 287-1256**

Don't Miss the Bus!

Homeward bound from AMA NATS '38
In front of bus: Carl Hatrak; Richard Scott; Leonard Chester; Stephen A. Vosa; John Lewis. In bus: Leo Schenkil; Al Jacobson; Buck McNeal; Jack Eckstein; Bill Laing; Mickey DeAngelis.

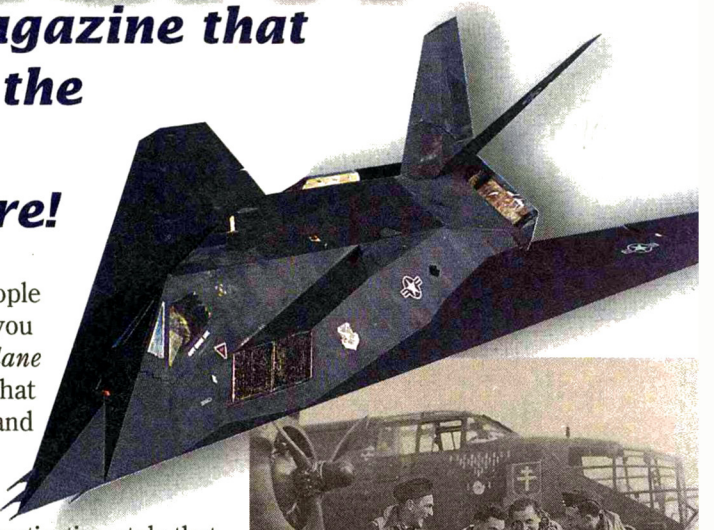
A special announcement from the publisher



INTRODUCING

FLIGHT–

a new magazine that explores the aviation adventure!



From the people who bring you *Model Airplane News* comes a new and unique quarterly magazine that captures all the drama, the history, the technology and the timeless adventure of aviation and aircraft. Introducing FLIGHT magazine!

FLIGHT looks at the world of aviation in an upbeat, captivating style that puts you right in the cockpit. From the first powered flights to WW II's Warbirds to the aircraft of today, from the compelling stories of man's brave experiences in the air to the technical details of a P-51B or Stealth Fighter, FLIGHT brings you the very best of full-scale aviation.

FLIGHT is for everyone–enthusiast, modeler, historian and pilot–who cherishes the drama of man and his flying machines.

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As a reader of *Model Airplane News*, you're invited to accept this charter subscription offer to FLIGHT. Return the attached card today to become a charter subscriber, and you'll receive a year of FLIGHT–including the premier issue (published in April)–for only $14.95. We'll bill you later.

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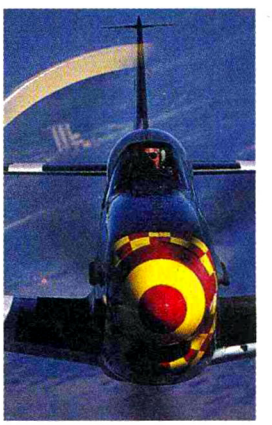
We guarantee you'll discover FLIGHT brings you the same high-quality content, the same entertaining reading, that you've come to expect from *Model Airplan News.*



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- "Virtual flight"—the computer flight-simulation experience.
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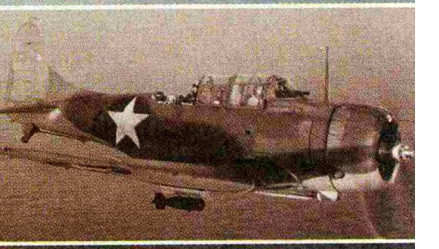


Built and flown by Terry Nitsch, this Maverick Pro was caught a quarter of the way through a smooth slow roll; finished in Presto film, paint and dry-transfer markings.

7TH ANNUAL Superman Jet Rally

by RICH URAVITCH

Bigger, better and highly prefabricated!

WHEN YOU'VE been around the R/C ducted-fan scene as long as I have (20 plus years), you can't help but be amazed at what has happened in this exciting and growing segment of modeling. Frankly, the R/C hobby, as we know it, is no longer accurately seen in general terms. In both professional or leisure time, we have become much more focused and specialized in our activities.

When I returned to Metropolis, IL (home of Superman, who was cleverly disguised as mild-mannered local FBO and CD Jerry Caudle), for the '95 edition of the Superman Jet Rally, I decided to depart from the usual "It looked nice," "It flew great" coverage format and to look instead at what has changed since ducted-fan models first appeared on the scene, and what, if anything, has remained the same.

HALF THE FUN

Getting to Metropolis gives you a much clearer understanding of why Superman flies; you can't get there from here!—not easily, anyway! But minor traveling difficulties didn't deter 155 participants from taking 182 jets to the get-together! Although I never did get a head count on the number of spectators, a couple of grand over the three-day event would not seem to be far out of line. The nice thing to see among the crowds of onlookers were the mesmerized faces of some of the younger kids; you could readily sense that they felt they were seeing a 3-D version of their newest air-combat video game, a re-creation of Top Gun, or a recent episode of "JAG." These kids may be from a video generation, but it was clear that they could relate!

One of a number of nicely finished BVM F-86s, this one was built by Eddie Betzer, who came all the way from Central City, IA; 12½ pounds; BVM .81 engine; K&B Superpoxy finish.*

KEY INGREDIENTS

Participation was up from last year, giving a strong indication that the event, along with the Greater Southwest Fan Fly (Texas) and Jets over Deland (Florida), is becoming one of the premier jet meets in the U.S. The formula for success was simple: provide an outstanding facility, understanding and competent flight-line management, nearly unlimited flight time for those who wanted it, an exciting mid-day opportunity to entertain the spectators and participants, a

This is what it's all about! Dick Rotkosky's 25-pound, scratch-built F-86F Sabre is launched for another trip toward the Yalu (just down the road a piece). The detail on this miniature aircraft has to be seen to be believed and appreciated!

Unusual subject: beautifully executed McDonnell F3H Demon. Designed and built by John Carlson and available in kit form from Falcon Model Works, the model weighs only 15 pounds and is powered by a Dynamax fan spun by an O.S.* .65! John can always be counted on to come up with unusual, but flyable, subjects.*

The BVM T-33 T-Bird of Herney Serrano on final approach: speed brakes out, landing/taxi lights on. What? No flaps?; must have LOTS of runway out in front of him! Hard to tell from the real thing, isn't it?

Albert Aroujo and his F/A-18 Hornet ARF jet from Air Champ Models. Believe it or not, all Albert had to do was install the radio, fan and retracts—no paint, no muss, no fuss! You knew it had to happen, didn't you? Right: Terry Nitsch's BVM Maverick Pro just after takeoff. The nose gear is tucked away in the well, the mains are just starting to retract, and the Pro is accelerating for another impressive flight.

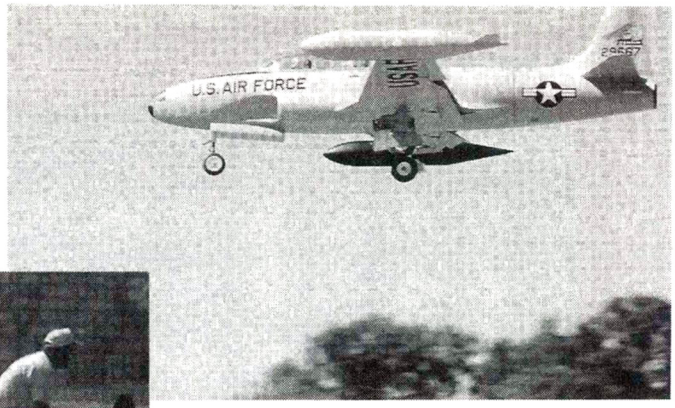
great pizza and beverage "mixer" in the evening, and a dinner/awards banquet complete with a "roast" emceed by Frank Tiano. Throw in the opportunity to try your hand at the riverboat casino, and you've got magic! I did say the formula was simple, didn't I?

SEASONED VETERANS

A good number of the airplanes were there last year and most had benefited from a year of being flown and having the bugs worked out. A prime example of this was the remarkable F-4J/S Phantom of BVM*. This airplane was unquestionably the most impressive of the non-turbine-powered models. It's big, smooth, as quiet as it needs to be and is probably the most sophisticated jet kit available today.

The other end of the spectrum—at least on the fire and brimstone scale—was the encore performance of the MiG-15 designed and built by Dave Ribbe. It was moderate in size, equally smooth and quieter than you could

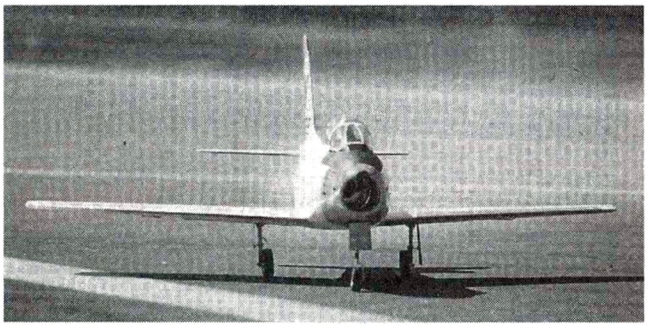
Left: although it has been around a while, the unusual Supermarine Attacker, designed and built by buddy Mike Kulczyk, is now owned, flown and lovingly maintained by Bill Kinney. No, the main gear isn't too far forward; the Attacker is a tail-dragger jet! Right: direct from his well-deserved win at the first World Jet Competition in Germany, Garland "Ham" Hamilton relaxes with the BVM Maverick Pro that he uses as his "trainer" while he isn't flying his crimson F-80 Shooting Star. A real pro, he's a pleasure to watch!



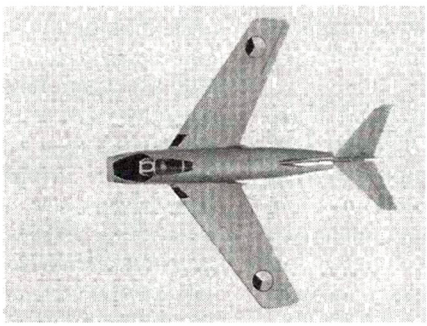
The ultra-prefabbed, highly composite T-33 from JMP was the starting point for this outstanding example from Steve Ray. Looking at the quality of some of the models on hand, it was hard to believe that the event was a fan fly rather than a scale competition.

imagine. It brings new meaning to the term "electric fan." Its performance was eye-opening; 6½ pounds, driven by a reworked Viojett rotor turned by an Astro* 40 FAI motor. Another MiG-15 that showed great potential was the Viojett-powered version of the Byron* offering converted by Paul Scheussler. The Byron MiG has always been considered a good flying airframe, and its performance with the tractor-style fan unit and internal ducting is sparkling and very pat-

Though the flight line was almost always active during the meet, it was always under total control and extremely well-managed. Those who wanted to fly never waited long for the frequency pin.



Taxiing back, about to clear the active, is the very pretty FJ-3 Fury (Navy version of the F-86 Sabre) built by Ed Longren. Slightly modified BVM kit; O.S. power; flew as well as any of the standard Sabres.



Dave Ribbe's own-design, scartch-built MiG 15—absolutely the quietest jet on hand.

tern-like. The pusher-type Byrojet fan unit, however, is still the fan of choice for a much newer generation MiG, the MiG-29 Fulcrum as kitted by Top Gun Aircraft*. At least two of these were flying throughout the event and were noted to be very aerobatic, yet docile at low speeds; ditto for the MiG's hangar mate, the F-15 Ultra Eagle.

TRAINER TALK

Much talk has been generated about what represents a good jet trainer—one designed and produced with the newcomer to ducted fans in mind. In fact, a good number of kits qualify; there's something for everyone, depending on the breadth of their skills and, not insignificantly, the depths of their pockets.

Proving that longevity is tied to reputation is the F-16 from Byron. These always show up in quantity at fan meets, and Superman '95 was no exception. I saw no less than seven fly; others were parked in the pits. The truly remarkable quality of this airplane is its tolerance of ham-handed flying. You can generally guess which Fighting Falcons have had the hardest lives; they're usually the ones that look as if they've been sanded with a grinder, film-covered with a blowtorch and painted with a roller! In spite of this abuse, they still reward their operators with a degree of stability, especially in the vertical descent mode, that

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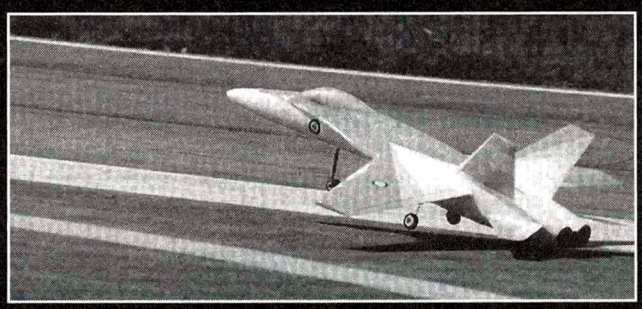
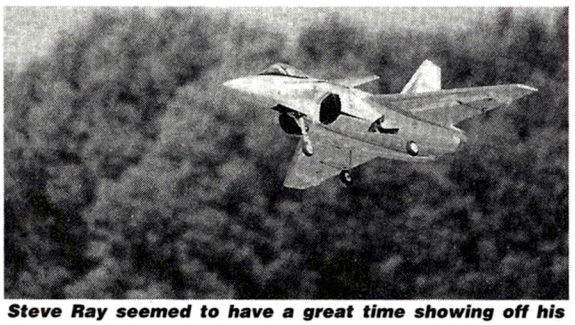
Jet Set ARFs

I've often heard the question: "Does anyone offer a ducted-fan ARF?" In fact, I most recently *saw* it on one of the online services. Until now, I wasn't aware of a truly almost-ready-to-fly DF model. Well, FANatics, that appears to be yet another piece of R/C history.



A real breakthrough in DF airframes: the F/A-18 Hornet from Air Champ Models. It's an ARF and looks almost like this right out of the box! Albert Araujo brought his all the way from Miramar, FL.

Albert Araujo from Miramar, FL, gave me a "walk around" his new F/A-18 Hornet from Air Champ Models*. This single-engine rocket ship has a colorful finish that's slicker than a Teflon™-coated skating rink! Albert claims he spent a couple of evenings installing the fan, radio and retracts and quickly had the Hornet on its way to the field! The glass work appeared to be of high quality, the finish outstanding and flying qualities excellent. It's repairable, as well—as was demonstrated after a minor altercation with a runway light! Now that the ice has been broken, I suspect that we'll start to see more of this type of model at fan meets!



Steve Ray seemed to have a great time showing off his Dassault Rafale jet. Built from the Avonds* kit, the model is finished in the prototype scheme and weighs in at a rather light 12.75 pounds. Typical delta; remarkable low-speed stability!

rivals that of a helicopter! It probably should be written into the flight manual that all you need to do for a safe landing is to aim the model into the wind, reduce power and start feeding in all the "up" stabilator available! If you haven't reduced power sufficiently, all it will do is hang there and hover!

Sharing similar qualities is the Regal Eagle from Bob Parkinson Models*. A lot of experienced jet fliers learned on these two models which, in addition to being great "intro-jets," frequently provide the flier with a "second chance" rather than rewarding him with a smoking hole because the airplane got way ahead of him.

"Trainer disguised as a sport jet" might be an accurate description of the BVM Maverick. There were more of these at this jet rally than all the other sport jets combined. Modeler experience ranging from almost none to that of scale aces like Garland Hamilton and Bill Harris covered the range of guys I saw flying "Mavs." The design appears to be well-thought-out, and the model can be finished as a simple sport jet or tricked out with a pseudo-military paint scheme and the "pro" options. It has become very popular in Europe as well.

Given the availability and price range of these time-proven designs, there no longer appears to be a real excuse for not getting into ducted-fan models!

TURBINE THEATRICS

Any modeler who wanted to see the latest hurdle in jet modeling being cleared would not have missed this event. We saw flying demonstrations from Kent Nogy, Bob Violett, Terry Nitsch and Bob Fiorenze—all with turbine-powered models.

As I said earlier, I've been around the DF modeling scene for many years; five years ago, turbines were only a topic of discussion in the lounge or at dinner *after* we had flown fan-driven airplanes all day! Well, they're here, and they are *now!* Some work still remains to be done, but most of it lies in the logistics area: education, safety requirements and product support. The hardware side of the challenge has been met, and production articles are being flown, almost routinely, by people like the ones mentioned. More airframes are being developed; others are being modified to accept the kerosene burners. No doubt about it: they work and *work well!* "Who'd a thunk it?"

The illusion is now complete; this new generation of powerplants duplicate the sound, speed and even the smell of full-scale jets. I guess the next mountain is a five-zone 'burner system!

FAB-ULOUSLY PRE-FABBED

Years ago, when ARFs first appeared in the sport and scale model markets, a lot of self-proclaimed "modelers" held that this "heresy" clearly signaled the demise of model aviation. Well, here we are some years later, and I don't see a reduction in the number of "traditional" kits out there. I do, however, see a pretty clear rise in the number of ARF models available throughout the R/C spectrum.

All this really tells us is that a lot of guys prefer to spend more time flying than building. They don't care whether the diehards call them "modelers" or not. They have a given amount of time to spend on their R/C pursuits and are willing to pay for a higher degree of prefabrication to get to what they consider the "fun" part: finishing and flying.

Many of the jet-kit manufacturers have recognized this and have responded by offering kits with levels of prefabrication never before seen. In the jet community, fiberglass fuselages have become almost standard. Fiberglass/composite-structure wings and tail surfaces now reside in the T-33 and Starfire IIC kit boxes from JMP*, nearly everything in the BVM line and the new Heinkel He-162 from Century Jet Models*.

Don Kanak provides the front end restraint while Bill Harris gets ready to tweak the engine on his BVM Maverick. This model was one of many "Mavs" at the meet; great DF trainer.

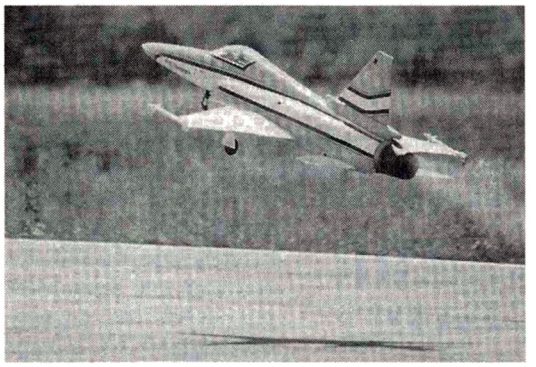
A small part of the BVM ramp area; scale models, sport models—something for everyone who's interested in DF models.

Of these, many have gear mounts already in place, linkages routed and hatches flanged when you open the box! There's still a good deal of work to be done, so the owner can still claim he's a "builder," if that's important to him. Regardless of your personal stance on the ARF issue, any modeler can appreciate the level of effort and attention to detail incorporated into some of these new-generation kits.

At DF meets, the Byron F-16 can always be counted on to show up and perform well. Flown by pattern ace Lewis Patton, this one—in Hill AFB markings—was amazing in the low-speed-flight regime.

FAN FORUMS

One of the attractions introduced at this year's gathering was the sche-



"Into the air, Jr. Birdmen." Flown by Dan Massey, this O.S. .91-powered Byron F-20 Tiger Shark beauty was one of the prettiest examples of this model I've ever seen. The prototype's Paris Air Show scheme still looks great! Rhom* retracts; 15 pounds.

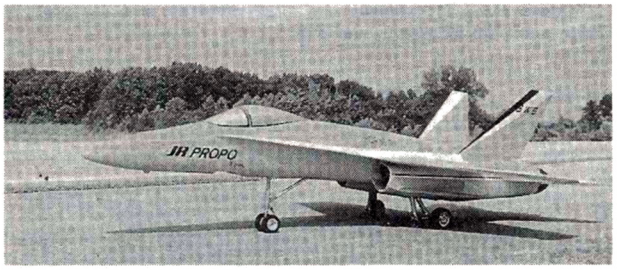
duling of forums at which manufacturers/suppliers held seminars. Both Bob Violett and Tom Cook talked about their products and jet models in general, delivering informative material and responding directly to specific questions from their audiences.

This is an extremely effective format—valuable both to the company and to the consumer. The customer gets his answer straight from the source (no rumor, innuendo, or speculation here), and the manufacturer gets direct feedback from users (helpful in product improvement and development). I had a specific question for Mr. Violett, but I didn't have time to ask it: "Do you need a product review on your JPX turbine?" He would probably have ignored me anyway!

Other manufacturers, although not conducting formal seminars, were always available to discuss products with anyone who stopped at their tents. Bruce Sanders of Century Jet Models was understandably proud of their new Heinkel and redesigned F-4. The Rhino on display was built by the flight-test team headed by Lewis Patton.

Lesher Model Aviation* now sells the Phil Avonds F-15 Eagle and Dassault Rafale; examples of both could be seen zipping around the field throughout the meet. Prolific John Carlson has formed Falcon Model Works* to provide an outlet for his new designs, the first of which is a really neat-looking McDonnell F3H Demon—forerunner to the Phantom. John can always be counted on to model some neat stuff; his past, but as yet un-kitted, efforts include a big MiG-21, a Douglas X-3 Stiletto, a SAAB Gripen and an F-8 Crusader.

Those who need custom (or stock) dry-transfer markings for a jet, or any model for that matter, should try contacting Pro-Mark*. These things provide solutions for everything you ever wanted in a marking system, but never really got. They're produced by someone who seems to know his way around scale markings. Caudle is his name. He produces these things when he's not busy FBO'ing, CD'ing, building, flying at Top Gun, winning at Toledo, or giving rides in his hot-rod Grumman Yankee. Here's a guy who could *really* use an ARF jet!



The largest of the turbine-powered machines at the meet was this F/A-18 Hornet, which started life as a Yellow Aircraft* kit. The SWB turbine engine developed by Jeff Seymour whistled, whined and rumbled most realistically.

PLANNING FANNING

Seven times and it keeps getting better. The scheduled dates for the '96 edition of the Superman Jet Rally are October 4 through 6. But if you plan to attend, try to allow a few extra days at the beginning of the event. Wednesday and Thursday are presently scheduled as days on which the U.S. Team that will compete in the 2nd World Jet Masters in Europe (England or Germany) in 1997 will be chosen.

For a chance to see the best our country has to offer in the jet world, make plans *now* for Superman '96. It will be a FANtastic experience!

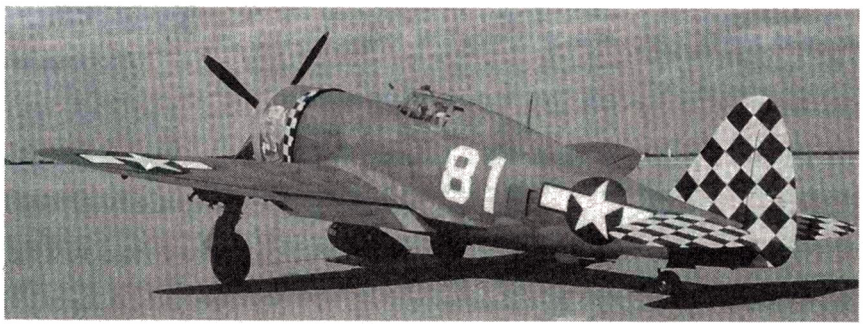
"Who left this SR-71 in the cart parking area? I only ruined THIS much of it!" Frankie T. makes sure that Luis Ontixeros' Blackbird won't fly again after its untimely crash!

**Addresses are listed alphabetically in the Index of Manufacturers on page 131.*

Scale TECHNIQUES

by GEORGE LEU

JETS VS. PROPS—ARE COMPETITION RULES FAIR?

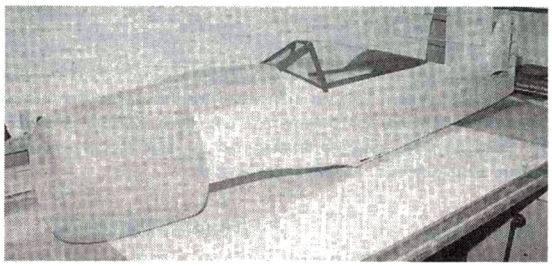


The plans for Brian Taylor's gorgeous P-47 Thunderbolt are available from Bob Holman Plans. If you don't have Bob's catalogue, by all means, get one.

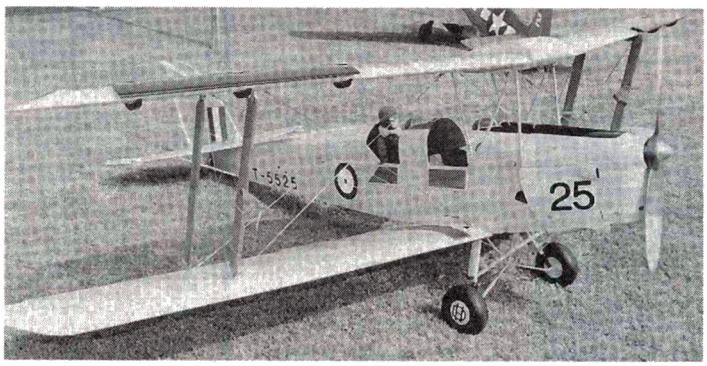
FIRST, I'd like to thank those who have been calling and writing me about my contributions to this column. Your kind words of encouragement are appreciated. This month, I have some product news and a suggestion for the scale-competition community that I think could allow all types of scale models to compete on an equal basis.

SCALE PLANS

If you're looking for an interesting scale-modeling project, order a catalogue from Bob Holman Plans Service*. You'll find information on plans, short kits, a fiberglass parts service and scale retractable landing gear for models of practically every design. Well-known competition fliers, such as Dennis Bryant, Mike Reeves, Brian Taylor and Gerry Fingler, have designed models that are also included in Bob's product line. Bob also has "scratch" kits for those who want parts that will speed up construction of a model built from his plans. Give him a call, or write for his catalogue; he's very helpful and a genuinely nice guy.



Don Smith is another great source of excellent plans for scale model aircraft. His plans come with beautifully drawn details that include rivets and panel lines to make detailing your scale masterpiece that much easier.



WW I models and most other tail draggers do not handle as well on the ground as trike-gear-equipped jets, and they don't fly as fast through maneuvers either. How about eliminating take-offs and landings as "mandatory" maneuvers and shortening their flyby distances for judging? Would this level the playing ground between jets and Tigermoths?

I recently received a Don Smith Plans* Fw 190A-8 plans set. This 1/5-scale, 89.6-inch-span aircraft is a real beauty. Don has thought of everything that the modeler might need, even a scale detail drawing included on his plans. What I like most are his full-size drawings that show rivet and panel-line details. Don's plans cost a little more, but that's because he uses a black line print on white bond paper instead of blueprints. There is no shrinkage or distortions of the original plans set. Don is another nice guy, and I'm sure he'll have a set of plans for your favorite aircraft.

FLIGHT VIDEOS

When you can't fly outside, it's nice to watch flying in the "couch-potato" mode. I've subscribed to the many videos available from Telstar Video*. Their production quality and flight-sequence presentations are very good. I recently received two new videos from Hansen Scale Aviation Videos*, and I am very impressed with the quality and the detailed coverage of flying events. Dick Hansen is well-known for his abilities to build and fly Proctor Enterprises'* WW I models, and his perspective as a knowledgeable competitor makes his videos unique. Hansen videos are also available in PAL format for you European scale modelers. I love videos that bring events I can't attend into my living room; it's the next-best thing to being there.

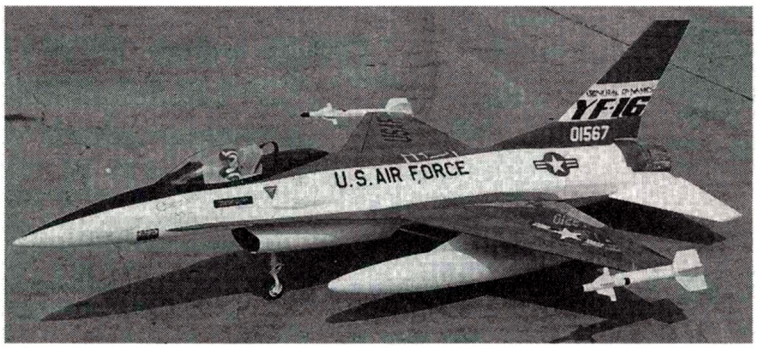
SCALE COMPETITION

For the last few years, I've been flying jet models at scale events. Competing with jets is a trend that I support; they've become more reli-

able, and they're a real crowd-pleaser. Also, more documentation is available for jet aircraft than for many other subjects, and that's very helpful for the competition enthusiast.

My biggest reason for using jets in competition is their flight characteristics. Jets almost always have tricycle landing gear, which makes ground handling superb. Maneuvers, such as proto-taxi, are easier to perform with jets than with WW I or WW II tail-dragger designs. It's virtually impossible to ground loop a jet; yet this is almost a given with a WW I model, such as a Sopwith Camel or a Fokker Dr.1 triplane. Ground loops are also quite common for the Me/Bf-109 or Supermarine Spitfire because of their closely set undercarriage track. Because there is no propeller-produced torque, jets take off more easily than prop-driven aircraft.

In the air, jets have one obvious advantage—speed. While it certainly requires skill to fly fast models, speed also works to the pilot's advantage while he is being judged. The speed of a jet model allows it to complete specific maneuvers in a much shorter time than WW I or WW II models. I still believe it's the modeler's prerogative to build whatever subject he desires, but it's grossly unfair to have judges critique one maneuver for 25 seconds, while a jet takes only 5 seconds to execute the same maneuver.



There's no doubt that jet models have the edge in scale competition (pictured here is a Byron* F-16 Fighting Falcon). Their faster flight speed allows less time to execute maneuvers and, thus, less time for judges to discern faults in the maneuver. The tricycle landing gear almost eliminates any chance for ground loops on takeoff—not so for a Sopwith Camel. Let's not ban jets from scale competition because they have an edge. See my suggestions.

TIME VS. DISTANCE

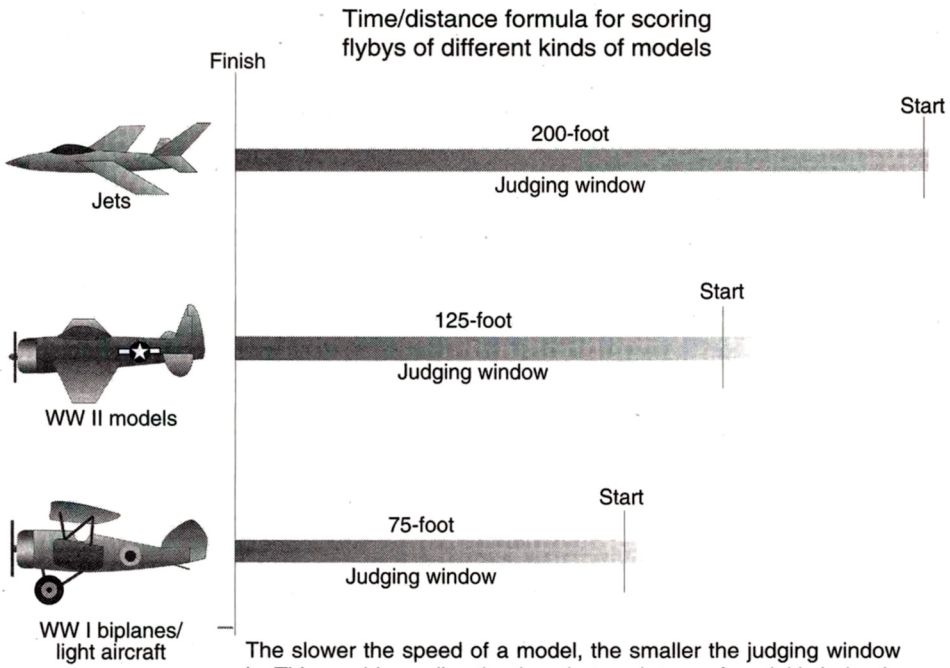
This time vs. distance problem plagued full-size aerobatic pilots when engine displacements increased and aircraft started to perform maneuvers so quickly that judges had difficulty distinguishing aerobatic flaws. Rather than simply banning the high-performance aircraft, the rules committee developed modified pattern maneuvers. Judging was restricted to a specific "time/distance" formula based on the performance of a given aircraft entered in the competition.

As a jet modeler, I feel terrible about people who want to ban jets from events or create a separate event for jets only. This type of thinking is at best shortsighted. I think I've come up with a solution that will work within our current system of rules and regulations.

- First, I would eliminate the mandatory takeoff and landing maneuvers for all aircraft and make them optional. If a contestant feels these maneuvers would benefit his flight score, then he should use them, but let's not force them on everyone.
- Second, I would reduce the flight distance to be judged in the mandatory passes performed by WW I, WW II and civilian-type aircraft. Because of its speed, a jet should be judged on a 200-foot-long flyby. A WW II, propeller-driven model should be judged on a 125-foot flyby, and a WW I or civilian model should be judged on a 75-foot flyby. This is only a suggested format, and I'm sure many contest directors will see the merits of this setup.
- Third, I would disregard the mechanical option scores for retracts, flaps, etc. If the full-size aircraft had these features or mechanisms, then the model should have them also. Let's not reward contestants for mandatory items.

I think the majority of competition modelers will support these changes to our rules and will agree that we need to encourage modelers to compete if our sport is to grow. Scale competition attendance will grow if we level the playing field. I hope to hear from readers (both modelers and CDs), so please write to me: George Leu, c/o *Model Airplane News,* 251 Danbury Rd., Wilton, CT 06897-3035. I'll report my findings next time out, and we'll see if it's possible to change. Until then, stay tuned.

**Addresses are listed alphabetically in the Index of Manufacturers on page 131.*



The slower the speed of a model, the smaller the judging window is. This would equalize the time that each type of model is judged.

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

Your quick ticket to classic aerobatics

I used 21st Century fabric covering and matchi ing paints, and the results are spectacular. These products are easy to work with and always provide excellent, high-quality finishes.

by MIKE MAYES

DIRECT from aviation's "golden age," the Great Lakes biplane is one of my favorite airplanes from the 1930s. It made its mark on aviation history during the early days of barnstorming. For aerobatics, the Great Lakes was a favorite of stunt pilots. Like the full-scale plane, this R/C version from Model Tech (distributed by Global Hobby Distributors*) has a vintage look and great aerobatic capabilities. If you've been thinking of trying a biplane, it could provide the perfect opportunity for you.

THE KIT

The Great Lakes arrives almost ready to cover (ARC). The hardware package includes wheels, wheel pants, landing gear, spinner, hinges, pushrods and linkages. Because covering is left to the builder, you can customize the plane's color scheme and appearance.

The fuselage and wings are nice and straight right out of the box. This is a new kit, however, and I did see a few minor production problems. I called Global to let them know what I had found, and they said they would investigate and fix these problems.

Editor's note: Global has issued an addendum that discusses several important items. If you didn't receive one, please call Global and obtain it before you proceed with the construction.

MODEL TECH Great Lakes ARC

SPECIFICATIONS

Model name: Great Lakes Biplane

Type: sport biplane

Manu.: Model Tech

List price: $149.99

Length: 35 in.

Wingspans: 47 in. (top), 34 in. (bottom)

Wing area: 585 sq. in.

Weight: 5 lb., 6 oz.

Engine range: .40 to .53 2-stroke

Engine used: Magnum .46 XL 2-stroke

Rec. prop: 11x6

Radio req'd: 4-channel (ailerons, elevator, rudder, throttle)

Airfoil: symmetrical

Comments: the model is factory-built and almost ready to cover; the kit has one-piece wings; molded-fiberglass cowl; plastic wheel pants; all the wood has been final-sanded; pre-shaped landing gear; pre-shaped cabane and interplane struts; complete hardware package; well-illustrated instruction booklet.

Hits

- Easy to build quickly.
- Excellent instructions and drawings.
- Complete hardware kit.
- Attractive, scale-like appearance.
- Great first biplane.

Misses

- The cowl did not fit the fuselage very well.
- Plywood cabane-mounting plate was installed in the wrong place.
- One warped aileron.

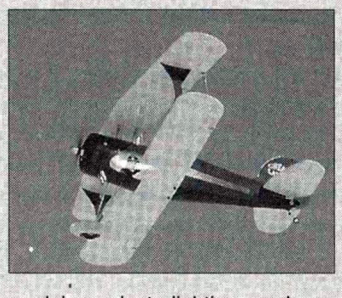
Editor's note: bad weather in the NE meant that the bipe had to be tested elsewhere. We asked Mike Lee in sunny California to do the flight review for us. Here's his report.

The Magnum .46 engine fired up on command and needed only a tweak of idle adjustment. We pointed the plane into the wind and advanced the throttle.

FLIGHT PERFORMANCE

• Takeoff and landing

As the Great Lakes began to roll, we gave it bit of right rudder, and it was airborne in about 90 feet. Unlike with many other biplane designs, takeoff was easy; the wide landing gear stance and generous tail moment were partly responsible. Once airborne, the Great Lakes was trimmed for level flight. For a sport pilot, landing the Great Lakes shouldn't be a problem. We kept the throttle at about ¼ until the bird was over the far end of the runway. With the throttle cut, our Great Lakes slowed gradually, and we applied up-elevator to raise the nose. Our model was just slightly nose-heavy, and this left us with full up-elevator in the flare. The plane never stalled or snapped; it just touched down and came to a stop in 75 feet. For the average pilot, this plane should be easy to land.



• Low-speed performance

At low speed, flying the Great Lakes was akin to messing with an advanced trainer aircraft. Again, this bipe didn't have the bad habits found in many other bipes. At ½ throttle, the "Lakes" was happy to fly around the sky with little attention from the pilot. With the throttle pulled back, it exhibited no tendency to snap-roll over in the stall; instead, it just pushed over on the right wing in a fairly gentle nose drop.

• High-speed performance

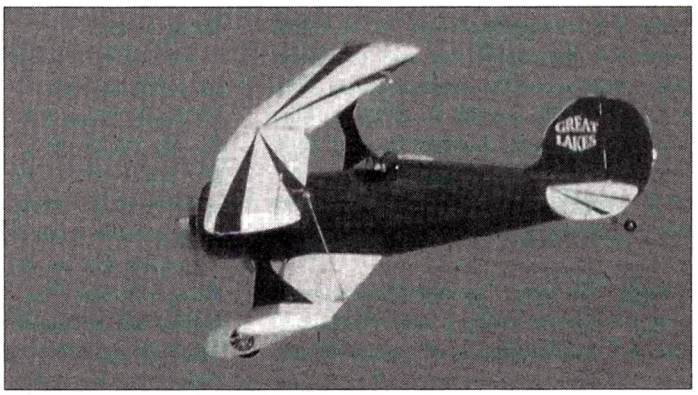
With full throttle from the Magnum .46, our Great Lakes had plenty of speed and power to perform almost any maneuver. Although this is a biplane, its top speed was quite good. There was a slight change to a nose-up attitude when we transitioned it from low to high throttle.

• Aerobatics

Continuous loops and long-legged stall turns were a cinch. Rolling maneuvers were pretty clean, but with the application of rudder during point rolls and slow rolls, there was a tendency to roll couple. Remember that this is a sport-scale bipe, not a pattern ship.

Rudder response during snaps and stall turns was immediate and crisp. Elevator response was also immediate, and we would caution any pilot against using more elevator throw than is recommended in the instructions.

Inverted flight used a bit more elevator than what we consider normal; however, the Great Lakes remained steady in the inverted position. Overall, this is a biplane that handles more like a monoplane than a bipe and begs to be tossed around the sky. A good, fun bird to fly.



Coverite's 21st Century covering material and paint is easy to work with and produces great looking results. Proper CG location and control surface throws will make the Fleet Bipe a stable, yet snappy perfomer.

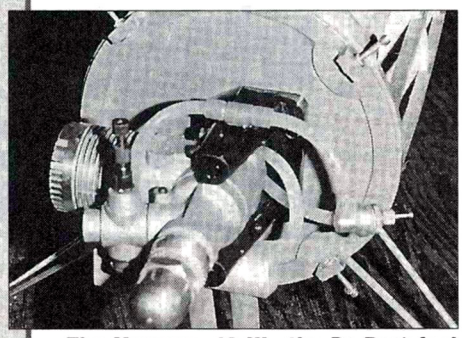
• **Fuselage**—light, straight and accurate in its scale-like appearance. Because the balsa stringers are very soft and break quite easily, you must be careful when handling the uncovered fuselage. The landing gear is installed in a slot in the bottom of the fuselage, and then a preshaped balsa block is epoxied into place over it.

A 240cc (8-ounce) fuel tank is supplied; to mount it, I put a bead of silicone around its neck and inserted the neck into the hole in the firewall. The tank is held in place by foam pads that help to reduce vibration and fuel foaming.

The cowl is sanded to fit and is held in place with four 4–40 cap-head screws. These screws are fastened to blind nuts that are inserted into plywood blocks in the cowl ring. Because of the muffler arrangement, I decided to remove the cowl ring and rotate it 45 degrees. To make the holes in the cowl, I drilled some small holes, then I used a Dremel tool and a small sanding drum to enlarge the holes to the size I needed. Two aluminum struts hold the upper wing in place; make sure that the strut screws go into the plywood block under the balsa-covered cabane-mount area.

When you show up at the flying field with it, people will be surprised to find out that it's an ARC kit. It has nice lines and looks very true to scale. If you're looking for a biplane that you can get in the air quickly, this one's for you.

• **Wing.** The upper-wing ailerons are hinged with the supplied plastic hinges, which are epoxied into place. Two wing-strut mounts must be correctly installed between the wing ribs and, in the center section, two holes must be drilled to mount the upper wing on the aluminum wing supports.



The Magnum .46 XL, the Du-Bro* fuel filler and the Slimline muffler installed. To allow the muffler to exit the bottom of the plane, the cowl ring was removed and turned 45 degrees.

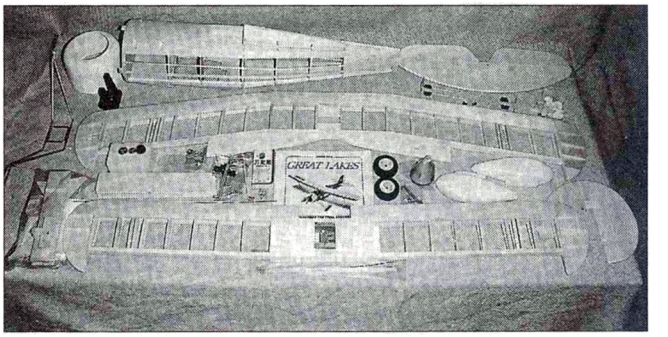
The lower wing is more involved. First, you must install the two aileron torque-rod assemblies in the torque-rod mounting strips. The center-section trailing edge is pre-notched, but make sure the notch is deep enough to clear the torque-rod movement. After sanding the trailing edge, I decided to reinforce the center section using light fiberglass cloth and CA. I used Balsa USA's* Gold thick and thin CA with great success; I highly recommend these glues.

• **Engine.** I chose a Magnum* XL .46 engine. To maintain the scale-like appearance, Model Tech recommends that you use a Pitts-style muffler inside the cowl. I chose Slimline's* muffler because it fits

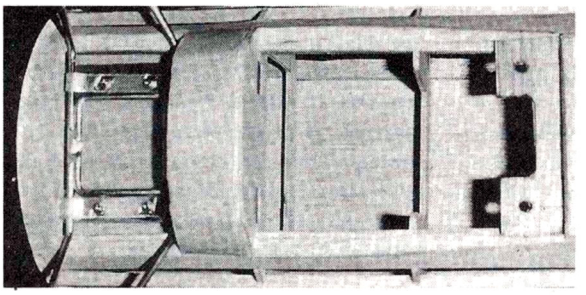
inside the cowl perfectly and can be bolted directly to the engine. My only modification was to move the pressure fitting from the back of the muffler to the side. This provides an easier hookup for fuel-tank pressure line. Before mounting the engine on the engine mount, you should determine where they will go inside the cowl.

• **Radio.** The Great Lakes Biplane requires only a 4-channel radio; I used a 6-channel Futaba* with Model Tech's recommended dual-rate setup. In the manual, the elevator dual rate given is incorrect; it should indicate 3/8 inch for the low rate and 1/2 inch for the high rate.

The servo tray is included and, after I had sanded it just a little, my Futaba servos fit right in. The ailerons in the lower wing use one servo in the center. The upper-wing ailerons don't require any additional servos because they're linked to the lower ailerons by connecting rods. To avoid aileron flutter, make sure these rods are stiff.



The kit right out of the box. To put this plane in the air, you need to buy only some glue, covering material, a radio and an engine.



The landing gear are installed with metal straps to allow them to handle those less-than-perfect landings. As you can see, there is plenty of room for radio gear.

• **Covering.** The original Great Lakes was fabric-covered. Coverite's* 21st Century fabric provides an excellent painted finish while maintaining the original's look. I really like to use this fabric because it's durable, factory-painted and doesn't have to be primed or fuel-proofed and, best of all, it's easy to apply. For the cowl, I used Coverite's matching paint and was very impressed with how well it matched the fabric.

When it's finished, the Great Lakes is a very nice vintage biplane that should provide many enjoyable hours of flying. When you show up at the flying field with it, people will be surprised to find out that it's an ARC kit. It has nice lines and looks very true to scale. If you're looking for a biplane that you can get in the air quickly, this one's for you.

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MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

by STEPHEN SCOTTO

TOP FLITE P-40E GOLD EDITION WARHAWK

THE CLASSIC P-40, with its distinctive shark's mouth, was made famous by the "Flying Tigers" in China. When the Top Flite* P-40E became available, I couldn't wait to build one. This new version has been re-engineered and updated to employ new materials and production techniques. The high-quality parts went together well; be warned, however, that there is plenty of building to do! It is a great kit for experienced modelers.

Naturally, there are some deviations from exact scale. The rudder and stabilizer hinge line have been simplified, and the landing-gear nacelles have been enlarged. Despite these small changes, the model has a very accurate scale outline, and it breathes realism.

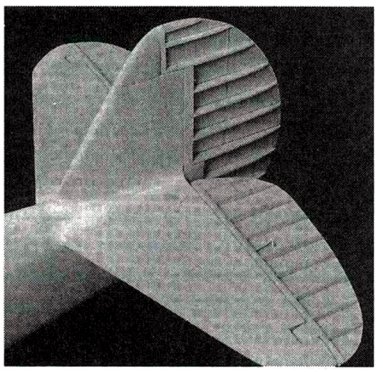
The Top Flite P-40E is ready for another sortie. The model looks authentic and flies smoothly.

THE KIT

The P-40 has balsa ribs and sheeting, die-cut lite-ply fuselage framing and hard points in the wing. A number of small plywood and hardwood parts are used for reinforcement. The cowl, nacelles and some of the details have been vacuum-formed of white plastic. Balsa blocks and thick sheets are used in the fuselage, and most are of high quality. Some of the ¼-inch balsa sheets used for the bottom of the aft fuselage were too heavy and hard to be carved properly. To save weight, I replaced them with contest-quality balsa.

The 56-page construction book is a masterpiece. You must read and follow the directions! There is an excellent discussion of the construction decisions you need to make and the optional parts available from Top Flite and other companies. The book also illustrates all the die-cut part sheets, and it lists the tools, supplies and parts required and sources of scale information. The construction sequence has alternate sections depending on whether you will install flaps or retract gear. Before I began construction, I went through the plans and crossed out the sections that did not apply to the version I built.

The instructions describe two finishing options—painted MonoKote* or fiberglass sheathing and paint. For a more true-to-scale appearance, I



The tail feathers in place and faired in with wood filler. Covered with MonoKote for an "authentic" look, the control surfaces include the ribbing detail shown here.

took the fiberglass and paint route. I installed the powerful and sweet-running SuperTigre* .90 2-stroke.

CONSTRUCTION

Both the rudder and stab have an airfoil shape and are built up over the plans. Tabs on the ribs ensure proper rib alignment. All flight surfaces are covered with 1/16-inch-thick balsa sheets that are joined at the edges with thick Zap* CA and cut to shape. The control-surface rib detail is shaped by having false ribs glued to a flat sheet base. The control surface is then covered with MonoKote—very realistic.

• **Wing**—a conventional design with balsa spars and ribs, balsa sheeting and plywood reinforcements. Be sure to follow the instructions for your choice of flaps or retracts. Like the tail, the ribs and spars are aligned over the plans with small tabs. The wing is joined with plywood center braces and 30 minute Z-Poxy.

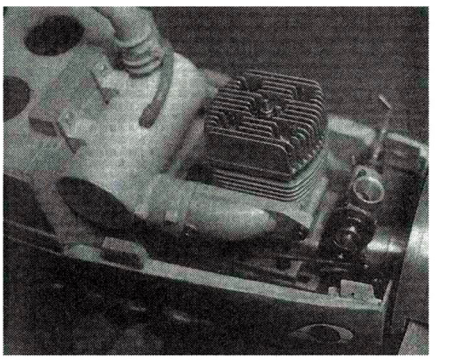
• **Flaps**—constructed of balsa and ply with a balsa leading edge. The realistic rib detail is made using many small pieces, each glued individually into place. Each flap is driven by its own servo, which is mounted flat in the bottom of the wing. To drive the flaps, I needed one servo to operate in reverse. I used an inexpensive Ace R/C* servo-reverser that is simply plugged in between one of the servos and the receiver to solve the problem.

• **Fuselage**—formed with 1/8-inch-thick balsa sides with lite-ply doublers and frame. The fixed top cowl and the fuselage corners are shaped out of thick balsa sheet. The tab-and-notch assembly system ensures that the frame pieces are accurately aligned. I replaced the standard tail wheel with a realistic, retractable Robart* unit.

• **Engine and fuel tank.** The stock setup is best suited to a long and heavy 4-stroke 1.20, and the plans show this installation in detail. The kit now includes an adjustable, filled-nylon engine mount that's strong enough to hold a 1.20 4-stroke or a .90 2-stroke.

To position the engine correctly and to make room for the Top Flite can-type muffler and header, I built a 1.25-inch-deep box of 1/4-inch-thick plywood, and I installed the firewall.

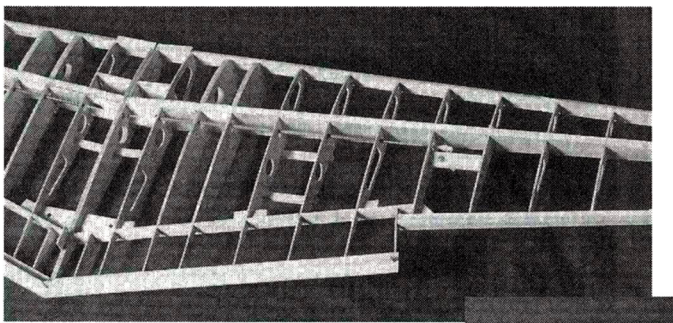
I used Davis Model Products* Iso-Mounts to hold an Edson adjustable engine mount. To gain clearance for the header and muffler, I installed the mount upside-down in relation to the engine. Holes in the cowl allow access to the needle valve and the idle adjustment. I fuel the P-40E through a Du-Bro* filler; overflow is routed to the muffler where it drains out when the tank is filled.



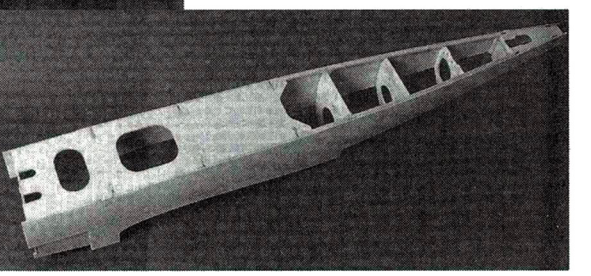
The SuperTigre .90 is ideal for the Top Flite P-40. It fits easily within the cowl, as do the can-type muffler and header.

FINISHING AND FINAL ASSEMBLY

I used 0.75-ounce fiberglass cloth from Aerospace Composite Products* and Pacer* Z-Poxy finishing resin. I followed the instructions on



The conventionally constructed wing has shear webbing on the main spar, and the flaps are split.



The basic fuselage structure is strong and light. Interlocking construction makes assembly easy and ensures accurate parts alignment.

SPECIFICATIONS

Type: 1/7-scale Curtiss P-40E Warhawk

Manufacturer: Top Flite

Wingspan: 64 in.

Length: 54.25 in.

Wing area: 697 sq. in.

Engine req'd: .61 to .91 2-stroke or .90 to 1.20 4-stroke

Engine used: SuperTigre .90 2-stroke

Weight: 8 to 10.5 pounds (review model weighs 11 pounds)

Wing loading: 36 oz./sq. ft.

No. of channels req'd: 6 (aileron, elevator, throttle, rudder, flaps, retracts)

Airfoil type: semisymmetrical

Prop: Master Airscrew, 14x6 plastic

Price: $249.99

Comments: the kit includes balsa ribs and sheeting; die-cut lite-ply; high-quality balsa blocks and thick sheets are used in the fuselage. Cowl, nacelles and canopy are vacuum-formed white plastic; 56-page instruction book illustrates all the die-cut part sheets and lists tools, supplies, required parts and sources of scale information; full-size plans; hardware; decals.

Hits

- Looks fabulous.
- Excellent design and well-thought-out construction.
- Highly detailed, very helpful instruction book.

Misses

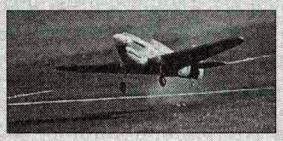
- Not enough about engine mounting in instructions.
- A few heavy pieces of wood.

FLIGHT PERFORMANCE

The Top Flite P-40E demands a certain amount of respect. It is heavier than the average sport model, and its weight must be taken into account when flying it. It isn't too heavy; it flies well with a gentle hand on the sticks.

I set up the SuperTigre with a 14x6 Master Airscrew prop, a McCoy* no. 9 glow plug and Power Master* 10-percent-nitro fuel. To get extra lift for takeoff, I set the flaps with about 1 inch of deflection.*

Power was applied gradually; right rudder to control the tail swing; and soon, it was running on the mains. Another 50 feet and it lifted off smoothly and climbed with authority. Pull the wheels up and, suddenly, it's China, 1941, all over again. This is a very realistic model; it doesn't get any better than this.



• Takeoff

The first takeoff was made with about 1 inch of flap deflection—a nice setting that gets it off the ground with authority. If power is applied abruptly, the plane will swing powerfully to the left, so you must bring up the throttle gently and apply full right rudder to control the ground run. Climb-out is steady and dependable: I pull the wheels up first, then the flaps.

• Landing

Keep it moving! Nothing fancy here; just bring it in a little more briskly than a sport model. Don't try any fancy 3-point landings; let it fly onto the mains, then slowly bleed off speed. Be very careful about applying full power at low air speed; the torque could twist this bird out of shape! Landings have worked out best with about only ½ inch of flap deflection.

• Stalls

Take it up high to practice stalls. A clean stall—no flaps or gear—will be sharp and straight ahead. A landing stall with gear and flaps deployed will abruptly drop a wing (depending on the wind direction) but is easy to recover from.

• Turns and Aerobatics

Until you have some experience with the plane, turns should be made with coordinated rudder and aileron and should not be too steep. It's a solid flier that doesn't show any tendency to drop from the sky. For more realistic flight, throttle back to around ¾ power. I confine my aerobatics to mild and scale-like maneuvers such as wing-overs, split-S's and gentle loops. Warhawks did not perform Lomcevaks in combat. This model's best maneuver is a strafing pass over the field. Starting from a high downwind pass, make a steep diving turn to level flight at about 20 feet altitude. To avoid overspeeding, dive at about ¼ throttle, then "firewall" the throttle stick as it levels out! This one always wows the spectators!

the box, and it turned out perfectly! Having applied the covering, look for surface imperfections, and fill them with autobody putty. Wet-sand with 400-grit paper, hinge everything together (except the flaps), and decide which color scheme you'll give your bird. I primed my P-40E with light gray automotive primer right from the spray can. Completely wet-sand the primer off between coats until everything is nice and smooth. Make the final coat of primer as thin as you can.

In addition to the Flying Tiger paint scheme, there's a huge variety of other, colorful, well-documented schemes; Scale Model Research* has a large collection of Foto-Paks to work from. The instructions recommend the use of Testor's* Model Master paint, which is designed for plastic models and matches the federal specification for the paint originally used on the P-40E. Model Master paint is not fuelproof and must be coated for protection. I painted the gray bottom first, then masked it off and painted the top. It took about three of the small spray cans of each color to cover this big bird.

The decals are easy to apply—except for the shark mouth. To smooth over the rough spots, I brushed on matching paint. Panel lines are 1/32-inch drafting tape from an art-supply store; they create a nice effect. I decided to put the dirt and wear on my model as well. The funny thing is, the dirtier the plane gets, the better it looks. For a top coat, I used 2-part HobbyPoxy* clear mixed with flat hardener—two coats sprayed on with an airbrush.

OK; everything that was removed for painting goes back in: radio, engine, fuel system, retracts and the 1/6-scale latex pilot figure from Hobbico*. Radio and linkage installation is straightforward and well covered in the instructions. Keep the batteries as far forward as possible. You will need at least seven servos, including one for the retracts.

With everything connected and installed, dry weight came out at 10.5 pounds. To achieve perfect balance, I epoxied 8 ounces of lead to the top cowl. This put the wing loading at 36 ounces per square foot.

AT THE FIELD

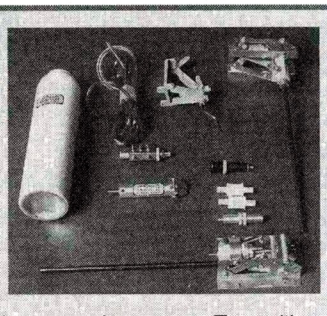
When I began taking the P-40E out, veterans of WW II stopped, looked it over, and told me about seeing the full-size Warhawk. They told me about pilots and airplanes over China more than 50 years ago—an incredibly moving experience.

The Top Flite P-40E is a great model that demands careful building and skillful flying. It is a beautifully designed, well-made kit that goes together well, flies in a scale manner and is utterly convincing in the air—a very rewarding model.

**Addresses are listed alphabetically in the Index of Manufacturers on page 131.*

WARHAWK LANDING GEAR

The instruction book recommends no. 615 Robart pneumatic retractable landing gear and the necessary air-control kit. These well-made units retract backward and rotate 90 degrees, perfectly simulating full-scale action. I also installed a Robart air-pressure gauge (part no. 173). I replaced the stock landing-gear wire with the recommended no. 650 Robart Robostruts, which have a spring action to damp landing shock. The Robostruts are too long as supplied; shorten them to 4.5 inches with a small tubing cutter. The Robostruts come with a 5/32-inch bushing that must be drilled out to 3/16 inch to accept the wire from the retracts. I drilled and tapped four setscrews to secure each Robostrut to the retracts. To position them precisely, I cut the wheel wells after I had installed the retracts. I saved weight by using Dave Brown* 3.5-inch, treaded, Lite Flite wheels.



Here are the parts that make up the retract system. I installed a Robart retractable tail-wheel unit and 90-degree rotating retracts.

MODEL AIRPLANE NEWS
CONSTRUCTION

P-51 MUSTANG

A giant-scale warbird racer

by DAN SANTICH

WHEN NORTH American Aviation came up with the P-51 in 1940, did they have any idea how much it would affect the outcome of WW II? It has always been a modeler's dream, finding its outline on everything from peanut-scale rubber-band types to control-line versions to giant-scale R/C models. It's probably safe to say that the P-51 has been turned into more model versions than all other designs combined. The reason is obvious; it's a *beautiful* airplane.

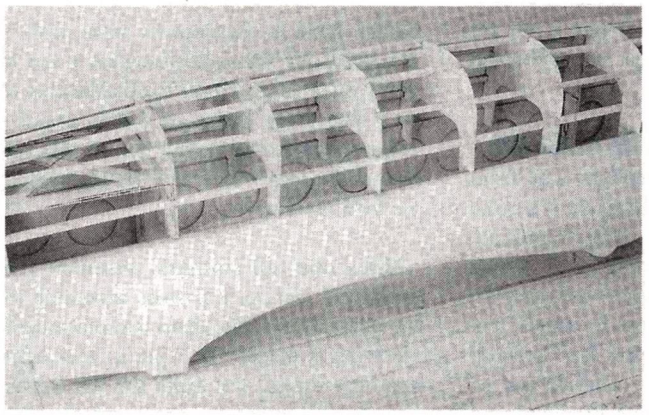
STARTING LINE

When unlimited racing first came along, I found myself searching for a kit that would meet the 100-inch minimum-wingspan rule. I was surprised to find that there wasn't much out there, particularly considering the engine I planned to use for my racer was a 7.3ci Husqvarna! Up to then, the largest engine I had fooled with was a 5.8 Sachs-Dolmar. There was no question that it would pull the plane, but I wanted more: I wanted an engine that would give me 150mph plus! The Husky could do that, and more.

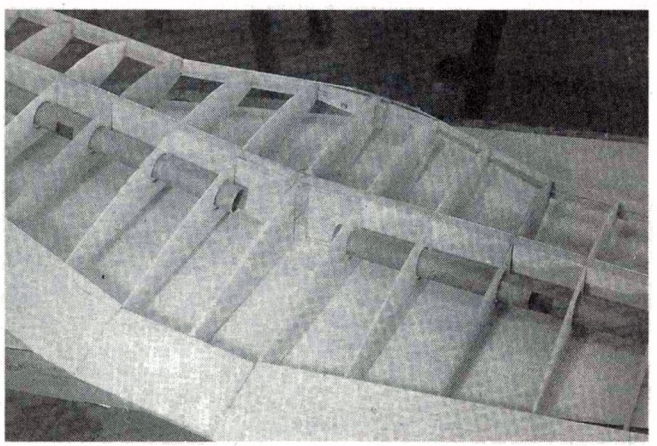
Now, when you deal with that kind of power, you're looking at a different breed of model airplane. The airframe must be able to absorb not only the air load but also the engine vibration. You must therefore build a very strong airplane but still keep its weight to a minimum. The structure I developed for this model does just that.

You will notice that I installed a SuperTigre* 4500 engine. I selected this engine for this article because it represents the "medium" power range for the design. Not everyone is going to the races! In fact, the number who do race will probably represent fewer than 1 percent of the plans sold. But I want to assure those who do race that the design will handle just about any engine you care to hang on the front end. Just keep in mind that the weight limit is 55 pounds.

The airplane's front end is really built around your engine, but you have to take the engine's weight into consideration.



When all the bulkheads have been installed, balsa stringers are added.



Cardboard tubes from empty Super MonoKote rolls make great servo-lead guides.

SPECIFICATIONS

Model: P-51 Mustang

Type: scratch-built unlimited racer and giant warbird

Wingspan: 101 in.

Length: 86.5 in.

Wing area: 1,720 sq. in.

Wing loading: 37.84 oz./sq. ft. (prototype)

Airfoil: symmetrical

Weight: 17 to 35 lb. (review model weighed 28 lb.)

Radio req'd: 6-channel (ailerons, elevator, rudder, throttle, flaps, retracts)

Radio used: Futaba FP-7UAF Super FM

Engine req'd: 2 to 7.4ci

Engine used: SuperTigre 4500

Features: balsa and plywood construction; uses a Tru-Turn 6-inch spinner and Ziroli canopy and cowl. This is an excellent design both for an unlimited racer and a giant-scale warbird.

As an example, the Husky 7.3 weighs 7 pounds. To achieve a proper balance, you simply build your airframe as shown. If you use a lighter engine, as is the case with the SuperTigre 4500, you simply build a box to the appropriate length and mount it on the primary bulkhead. The engine box is made of ¼-inch-thick plywood; you cut slots in the primary bulkhead and mount the box on it—a very strong arrangement.

The primary bulkhead is three layers of ¼-inch plywood (aircraft grade), and the top and bottom braces are also of ¼-inch plywood. They are keyed into the second bulkhead (also ¼-inch plywood), and the sides are made of ⅛-inch aircraft plywood. Surprisingly—thanks to the lightening holes—this structure weighs less than 2 pounds.

In my prototype, I used my trusty Robinaire* P-51 retractable main gear and a Robart* retractable tail-wheel unit. The plans show Robart's giant-scale retracts.

For guidance, I selected a Futaba* 7UAF Super FM and used their 9201 ball-bearing servos (two servos each for the elevator, rudder, ailerons, and flaps). The aileron servos are mounted near the control surfaces and connected with extensions and a choked Y-harness. The flaps are also similarly arranged, but the leads are not long enough to need a choke, nor are the elevator or rudder servo leads.

The cowl and canopy for this model came from Nick Ziroli Plans*, and Tru-Turn* provided the spinner.

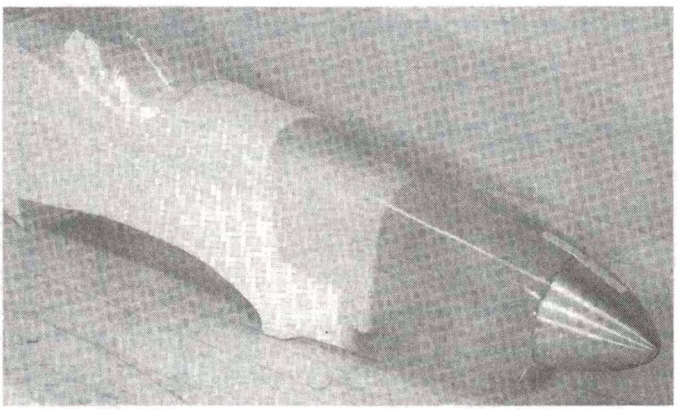
MUSTANG METAL

That gives you most of the general information except for the covering. This is the first model I've ever covered completely with aluminum. To tell you the truth, I was very apprehensive. For years, I had heard nothing but horror stories about guys who tried to fly aluminum-skin models, but then I saw one in Vegas that flew well. And Charlie Chambers came along with his fantastic aluminum-clad P-51 and had a great time in the scale circle. Art Johnson also has one, as does Dave Platt. I decided to call Dave and get his advice. He told me not to worry about it! He said he even flew his metal-covered P-51 one time with the antenna wrapped up inside the fuselage!

This model's aluminum skin is a combination of printers' litho plates, roof flashing and aluminum duct tape. For the flat surfaces, I used the roof flashing; for the compound areas, the tape; and for the panels, gear doors and fillets, I used the litho plates. My adhesive was a slow-curing epoxy.

I first cut the panels to shape, rough-sanded the backs of them and then applied a very thin layer of epoxy. I put the panels into place and held them there with tape until the epoxy had set. This takes a lot of time and effort, but the results are outstanding. With all the skins in place, you can add your panel lines and rivets with a scribe or a ball-point pen. Then take some fine steel wool and lightly burnish the surface.

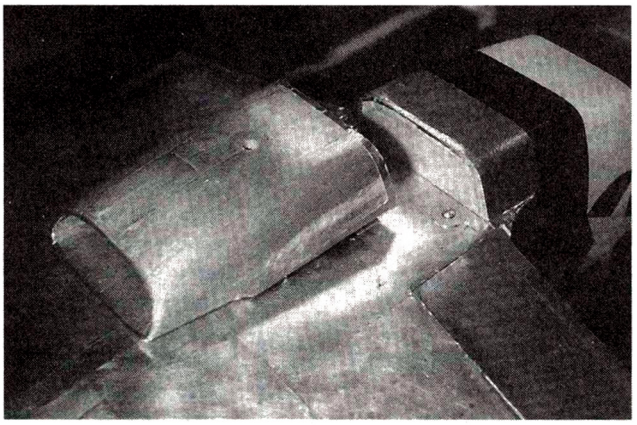
For the final touch, take an ordinary pencil, sand off some of the graphite, and rub it into the aluminum in a "downwind" direction at each panel. This gives the metal a striking weathered look.



Nick Ziroli Models P-51 fiberglass cowl and canopy are used with a 6-inch Tru-Turn spinner.

I hand-painted the markings—not that difficult. I use liquid-masking film, which is great stuff: simply brush it on, let it dry, draw your design on with a marker, cut the design with an X-Acto knife, peel off the area you want to paint, paint it, and then peel off the rest of the masking. It's really easy to do.

For the sliding canopy, I simply glued a



The lower scoop is held in place with a nylon screw; 1/8-inch-diameter dowels serve as keys.

roof flashing, as are the seat and instrument panel.

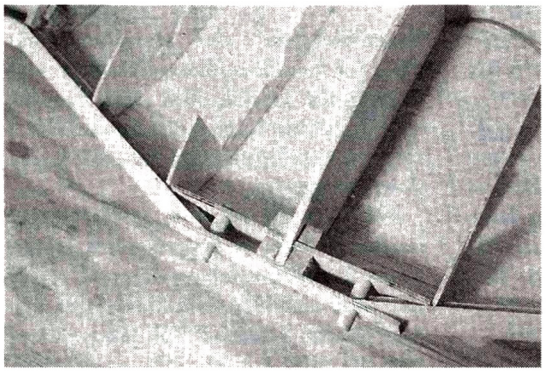
CONSTRUCTION

• **Fuselage**. The front end is where it's at, so start there. Laminate three pieces of 1/4-inch plywood to form F1. Be sure to cut the slot for the top 1/4-inch brace. Cut F2 out of 1/4-inch plywood and cut your 1/8-inch-plywood side braces.

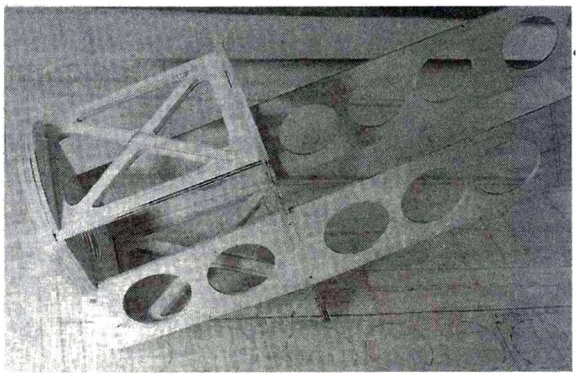
Make sure everything is aligned, and then epoxy this assembly together. I like to hold things with small brads, which I nail into place. Next, glue your balsa sides to the 1/8-inch plywood side braces. Check the plans to see where to join these sides. Install all of the formers, and glue the rear ends of the sides together. Add the 1/4-inch balsa stringers, and then sheet the top with 1/8-inch balsa. For the bottom of the fuselage, I used 1/2-inch, 1/4-inch and 3/8-inch-thick balsa. Be sure to install the tail-wheel blocks. Sand the fuselage to shape, and fit the cowl to suit the engine you plan to use. If you use the Husky, leave the bulkhead as it is; if you use a lighter or shorter engine, build the engine mounting box so that the face of the prop washer will be just beyond the front of the cowl.

• **Wing and tail feathers**. Assemble the horizontal and vertical stabs according to the plans. Don't glue them into place until the wing is made. The wing is very light and very strong. The spars are 1/2x1/4-inch basswood and are "boxed" with the 1/8-inch plywood dihedral braces, front and rear, as well as with the 1/8-inch lite-ply shear webs. Pin the bottom spar to the plans and glue the ribs into place. Add the top spar and the shear webs.

piece of 1/16-inch-i.d. brass tube to each side of the fuselage and two pieces of piano wire to the inside of the canopy. The brass acts as the track for the piano wire—very simple. The canopy frame is from K&S*. The cockpit is made of aluminum



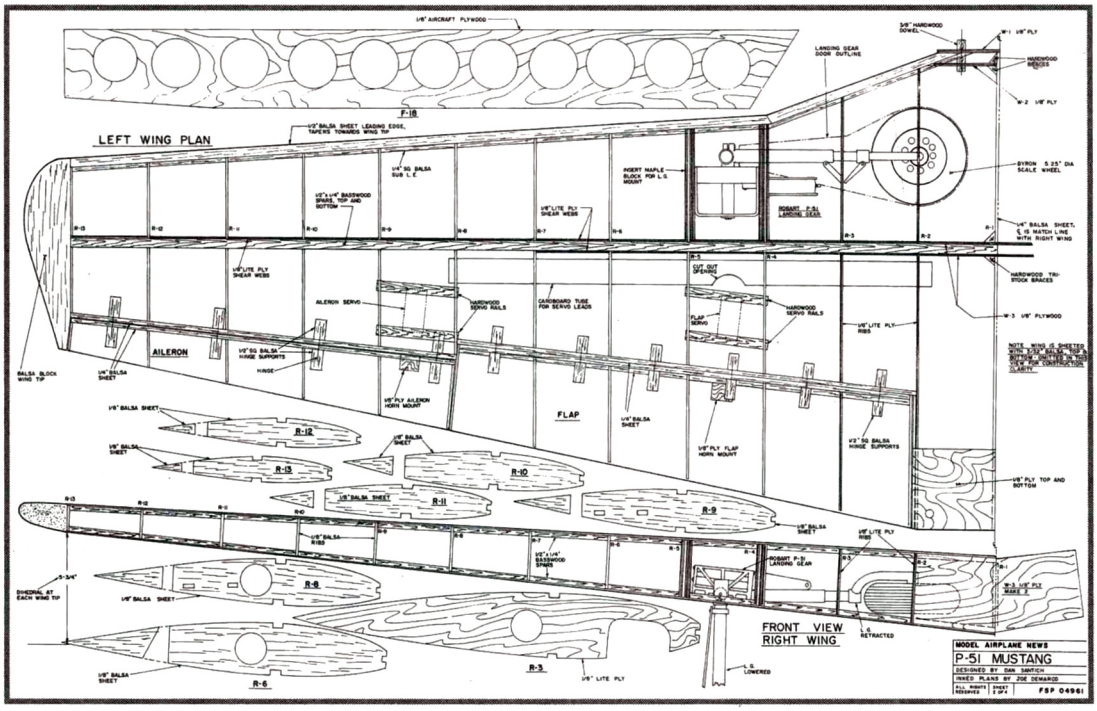
Left: hardwood dowels hold the wing at the leading edge. Note the plywood supports at the front and rear.

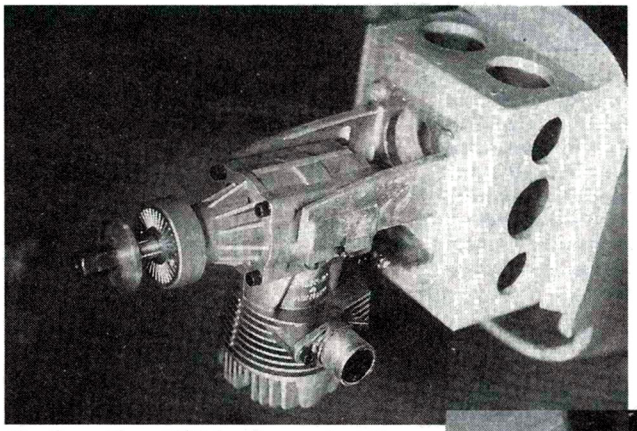


Make the nose first, and build the fuselage around it. Note the extensive lightening holes. The engine bulkhead is made of three pieces of 1/4-inch-thick plywood laminated together.

Cut servo-lead tubes out of empty MonoKote* rolls, and glue them into place. Add the dihedral braces, and glue the two wing halves together. Glue the center rib into place, and make appropriate cutouts for the landing gear. Mount the gear on maple blocks.

Glue the forward plywood braces for the wing dowels into place, drill the holes for the dowels and glue the dowels in. Glue hinge-support blocks to the control surfaces and the wing. Sheet both sides of the wings, cut out the ailerons and flaps, then add wingtips. Drill the holes in F2 for the



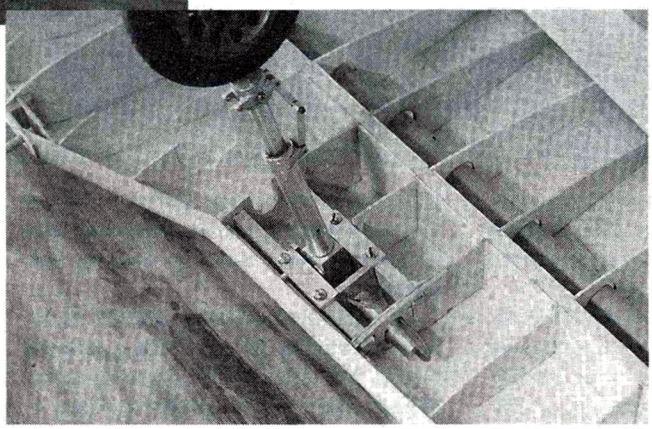


The SuperTigre 4500 for the sport version. Note the 1/4-inch-thick-plywood engine-mounting box.

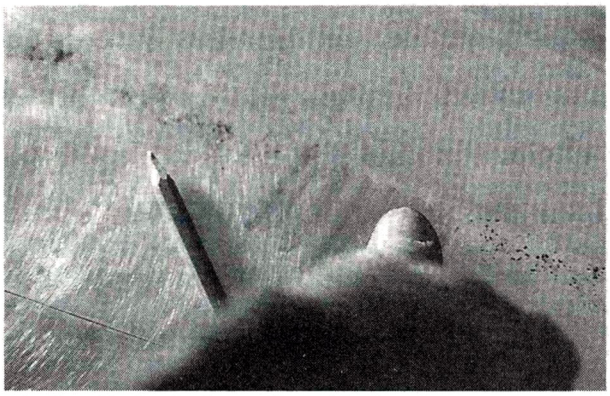
wing dowels, and mount the wing on the fuselage. Drill and tap holes for 1/4-20 wing screws in the wing's trailing edge and in the mounting block in the fuselage.

Make the removable air scoop. Key this scoop onto the bottom of the wing with 1/8-inch-diameter hardwood dowels. In the plywood plate on the lower trailing edge of the wing, drill and tap a hole for the 1/4-20 nylon screw that holds the scoop in place.

With the wing in place, mount the horizontal and vertical stabs, glue them, then add the tail fillets. Remove the wing from the fuselage, and glue the wing fillets into position. Sand the airplane thoroughly, and you should now be ready to cover.



The Robinaire P-51 gear is very rugged. It even withstood a crash at Madera. The wheels are from Byron*.



For "weathering," rub pencil graphite into the scratches in the aluminum skin.

• **Covering.** If you decide to finish your model in metal, great! If you have questions, I'll be happy to respond. The airframe is strong, so if you like, you can cover the airplane with heat-shrink film and save about 2 pounds in weight. Even with the aluminum covering and the engine, mine came in at just under 28 pounds.

The P-51's flight characteristics are very steady and predictable.

FLYING

Before you attempt to fly this model, be sure the balance point is correct. Control travel is not critical, but you surely want enough to fly the airplane. I put in as much as I could get, and I use my dual-rate function to adjust travel in flight, if necessary.

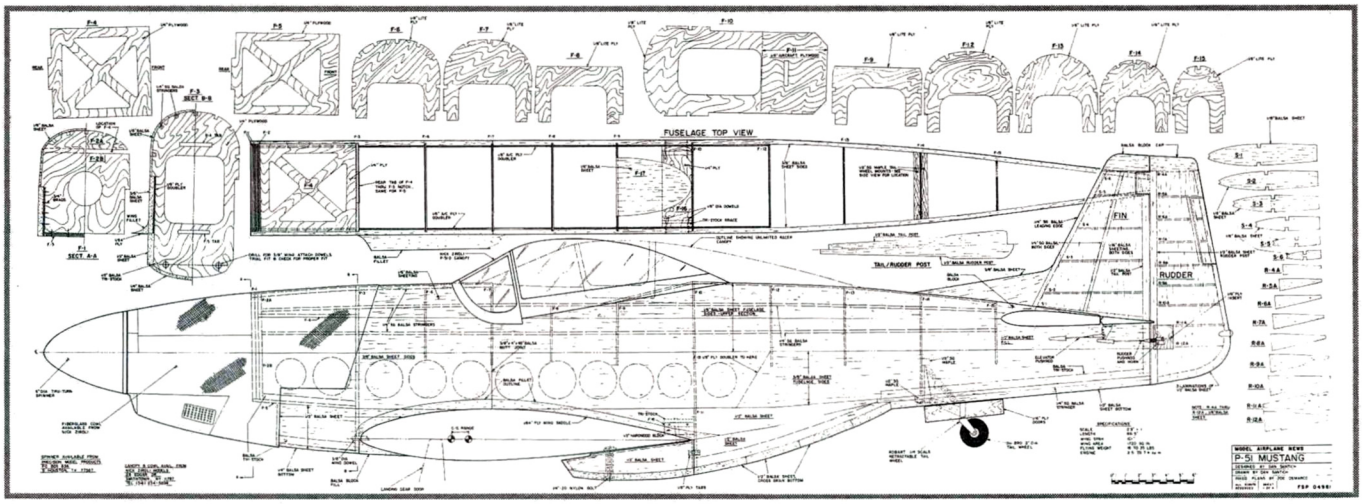
The P-51's flight characteristics are very steady and predictable; it's a smooth flier at all speeds. With full flaps, there will be a slight rise in the angle of attack, but nothing drastic. Landing this model is as easy as I have ever seen. On the landing approach, I drop the gear first and then slowly lower the flaps to the one half setting while coming back on the throttle. I let the model establish a shallow sink rate and then maintain that with throttle.

On final, I go to full-down flaps and ease in a little down-trim. Over the fence, I come back on the throttle and flare out for landing. Because of the wingtip washout, the P-51 will hold a high angle of attack without stalling.

This attractive model is fun to fly—for sport and racing competition. I hope you enjoy it.

**Addresses are listed alphabetically in the Index of Manufacturers on page 131.*

ORDER THE FULL-SIZE PLAN...SEE PILOTS' MART.

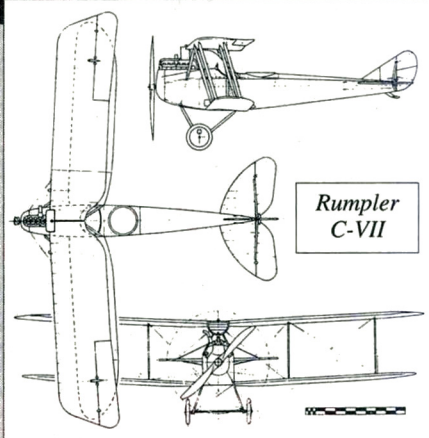


Explore the possibilities...

by DAVE PLATT

Something Different

One for the WW I buffs. The Rumplers aren't as famous as the Fokkers or the Sopwiths but, boy, they're pretty. Any of the German two-seaters make fine modeling fodder; we like the Rumpler's graceful, swept wings—great color schemes, too.



WW I German Aircraft — By Peter Gray and Owen Thetford

WHAT MAKES a knockout scale R/C model? Like love, it might be something you've been looking for in all the wrong places!

An enduring paradox of scale modeling is that, although most of its practitioners yearn to see (and indeed, to have) a model that's different from everyone else's, they buy only established favorite subjects.

It might be said that these choices are governed by what the industry offers. Obviously, a company will sell more P-51s and Piper Cubs than Brewster Buffalos if the Buffalo isn't in their line. Still, when companies offer unusual choices—despite attractive and aerodynamically sound selections—they mostly fall flat on sales and often can't break even on their development and tooling costs.

I don't have any answers to this discouraging dilemma. I suspect it will always be here. Nevertheless, that longing to be different remains with many scale fans; when they see something unusual, their eyes light up like they never would for even the best Corsair.

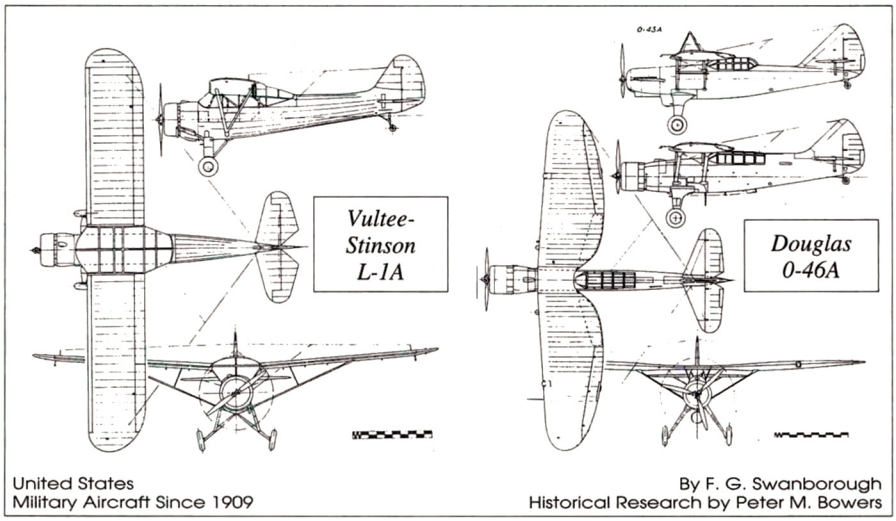
Of course, herein lies the greatest incentive for learning how to design your own models. No longer would you be limited to projects that are commercially available in kit or plan form. The entire history of aviation would open itself up to you. Do you prefer WW I stuff? There are loads of lovely subjects that have never been touched. What about '30s racing planes?—same story! Even with the great popularity of WW II aircraft, there are still hosts of appealing and suitable choices waiting to be made. Jets?—again, same story. The tendency of the industry to keep delivering repeats of the old subjects, albeit in different sizes and constructional methods, has meant that the surface of choices has only been scratched; hundreds of good ones remain.

This article isn't about how to design your own model. That is, of course, an involved subject and needs more space than this article—perhaps this entire issue—provides. For those of you who have designing ability or are willing to try, my purpose here is to suggest places where you might look for unusual and appealing models. Even in this endeavor, I can't be all-encompassing; the pot is simply too big. All I can do is give you a start—a little push in the right direction—and leave you to research your own areas of special interest.

The three main sources of information and inspiration are plastic kits, museums and books.

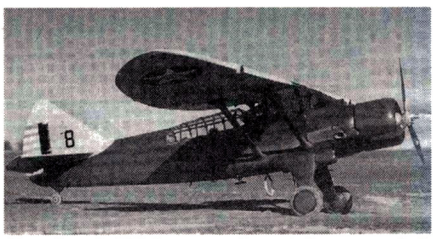
PLASTIC KITS

By and large, plastic-kit manufacturers have been more adventurous than the flying-model folks. Although you won't find too many really off-the-wall items (no Grumman F5F, for instance), there's still quite a variety of obscure kits. In fact, some are so esoteric that you have to wonder whether the normal laws of economics were suspended for long enough to afford their makers a profit. Anyway, the point is that browsing the plastic-kit shelves in your favorite hobby shop can yield some interesting ideas. I usually end up buying a couple of kits. I don't build them; rather, I use them

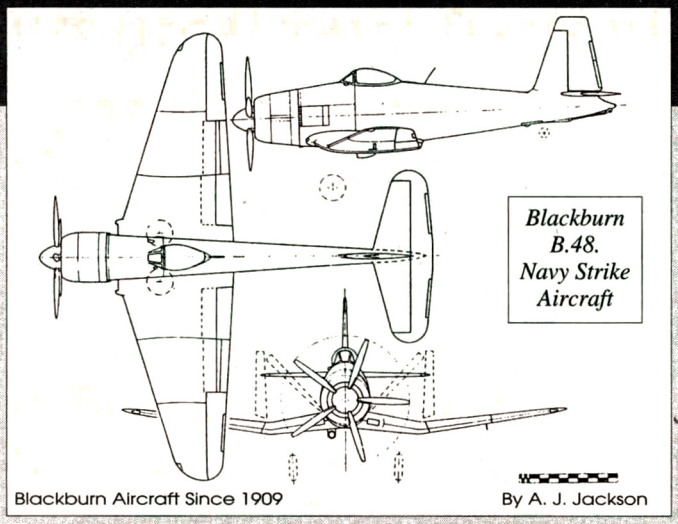


United States Military Aircraft Since 1909 — By F. G. Swanborough Historical Research by Peter M. Bowers

Just because you want an easy-to-fly high-wing monoplane, that doesn't automatically mean a Cub, a Bird Dog, or a Champion. What about these dillies? The Stinson is a big plane (51-foot span). The Douglas has to have the prettiest wing ever!

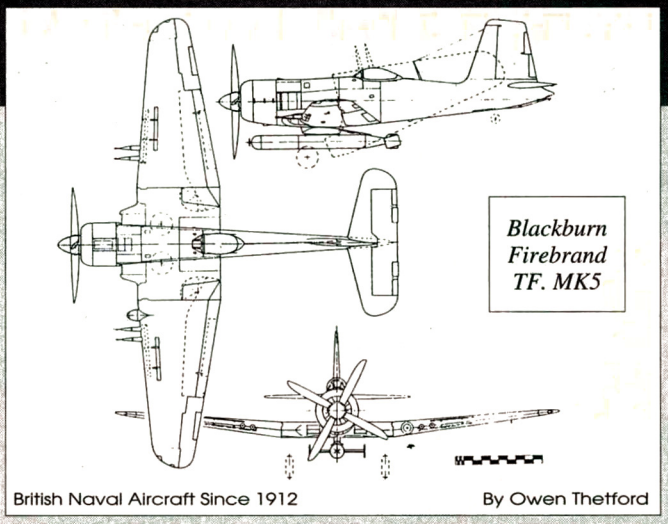


Douglas 0-46A has great modeler appeal. A warbird, with a unique wing and easy flight characteristics.



Blackburn Aircraft Since 1909 — By A. J. Jackson

Outrageous you want? Fantastic looks couple well with pattern-style flying ability in this 1947 Blackburn design for the Royal Navy. The reaction when you bring one of these out to the field: "Geez, that's great! What is it?"



British Naval Aircraft Since 1912 — By Owen Thetford

Will you be the first with one of these? Another simply delicious Blackburn fleet fighter of the '40s and '50s. We've seen the Sea Fury. What about a Firebrand?

to compare color schemes and to see the three-dimensional shape of things while I design.

MUSEUMS

All aviation museums have a catalogue of what they display. A call to the front office will get you a list of what can be seen. Often, interesting, offbeat types lurk among the more popular stuff. For example, the Air Force Museum at Wright-Patterson AFB recently put a Macchi 200 Saetta on display. As far as I know, it's the only one in captivity, and it would make an outstanding R/C scale model.

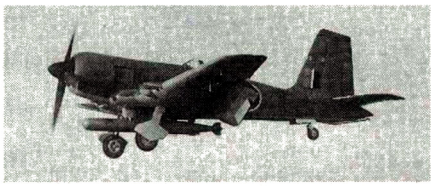
BOOKS

Reference books provide the most readily available and complete sources of documentation on aircraft. A logical first step here would be to call Zenith Books* and request their catalogue.

The kind of book that would be most useful for the search I'm suggesting is one that has 3-views (even if they're small) of the described airplanes. Although they might be too small or too incomplete to serve as design tools, they may help you to find something that is aesthetically appealing. Data can come later; at present, we're looking for inspiration.

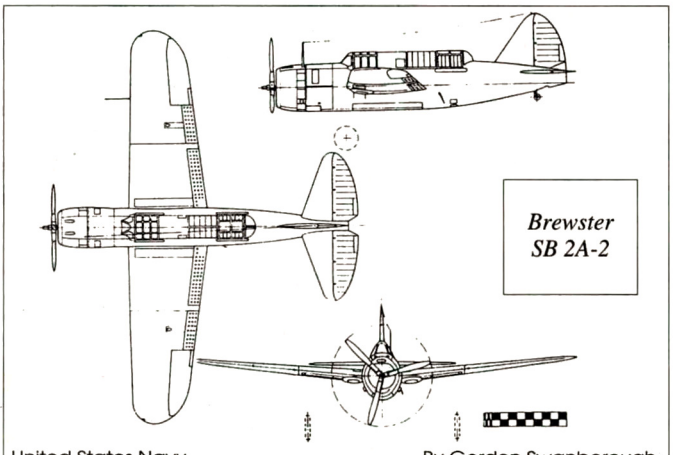
As an illustration of this idea, I've included several little 3-views. All of these aircraft are, as far as I know, new territory for R/C scale. Every one would be an attractive and interesting model, and every one would fly well. The selection shown here is but a tip of the iceberg for the R/C scale fan.

Always keep this in mind: don't become a slave to notions of "beauty." Certainly, there are aircraft that by any reckoning are beautiful: the Spitfire, the Mosquito, the P-38 and the Minimoa sailplane come to mind. But beauty is not the only route to an appealing model. "Chunkiness" is indeed another route. The Bearcat, the Typhoon and the Black Widow aren't beauties in any aesthetic sense, but they make fine-looking models. On the other hand, who can deny the stark ugliness of the Stuka? Yet, a model of the Stuka can be a drop-dead knockout if it's done well. In the examples included here, I concentrated on aircraft that I felt would make outstandingly attractive models without regard for how the full-scale machine would rate in a beauty contest—something to think about!

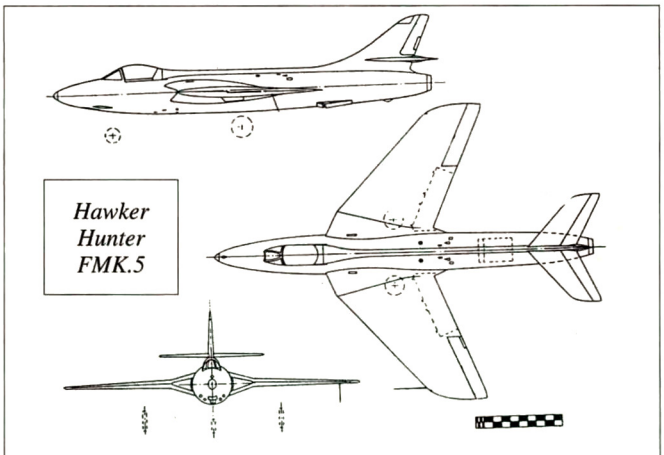


This photo shows the Blackburn Firebrand TF MK5 coming in for a landing October 25, 1945, at Farnborough, England.

**Addresses are listed alphabetically in the Index of Manufacturers on page 131.*



United States Navy Aircraft Since 1911 — By Gordon Swanborough and Peter M. Bowers

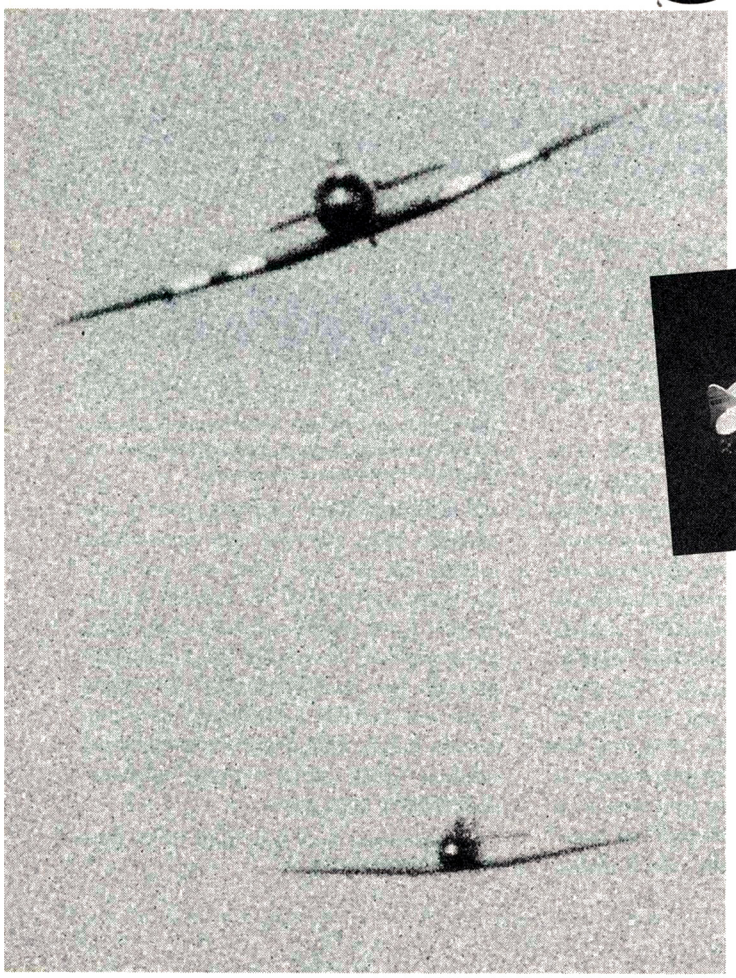


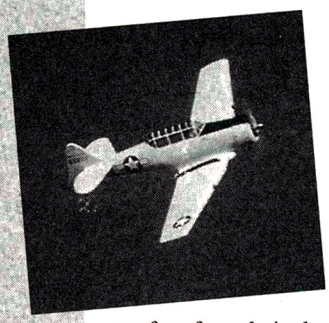
Aircraft of the Royal Air Force 1918-57 — By Owen Thetford

Left: here's another obscure and unsuccessful aircraft that nevertheless would make a great R/C scale project. Buccaneers and the British Fleet Air Army version called the "Bermuda" made a brief appearance in WW II; easy retracts, long canopy and perforated flaps add character. Right: how come the jet jocks all missed this one? To this day, the Hawker Hunter is still among the most aesthetically pleasing of all jets; it boasts plenty of exciting color schemes, and many nations flew them. An all-red Hunter briefly held the world's air-speed record, too.

Bringing big-time racing to small-town flying site

Racing Midwest





WITHOUT A DOUBT, the stock, G-62-powered AT-6 Texan class is one of the most popular giant-scale classes at races such as Madera and Galveston. But to the average sport flier, the 101-inch-span Texan can be intimidating. Its giant retracts, servos and landing gear require large building boards, flying fields, racecourses and, of course, a big station wagon or truck in which to transport the plane. This T-6 is perfect for relatively inexpensive, stock-regulated, "big" racing action. But what about the "Joe Average" modeler who doesn't want such a large model or investment?

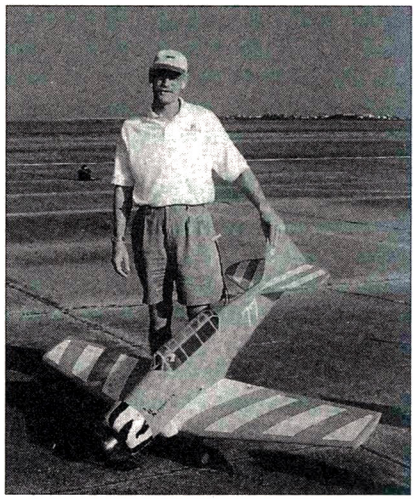
THE MIDWEST MOVEMENT

To bring the excitement and fun of racing down a notch for the regular guy out there in the real world, Ed Rogala of Midwest Products* and Frank Tiano of FTE* formed the T-6 Race Association (T6RA). Frank initially promoted the concept and took charge of the organization. Rules and regulations were drafted, and the event began to take shape. The first T-6 race was held at the 1995 Galveston Unlimited Races at the Galveston Municipal Airport. The Midwest Texans and the giant racers raced on the same 1,600-foot course, which proved to be too large for close racing. It did, however, prove that the smaller 84-inch-span Texans are good for simpler, easier racing.

ENGINE SPECS

The engine rules are intended to keep everyone in the same performance range, and so that the best pilot—not the pilot who has spent the most money—wins.

- Any normally aspirated 2-stroke or 4-stroke glow, diesel, or gasoline engine of 1.25ci displacement or less may be used. Superchargers, root blowers and air chambers are not allowed. Engines must be stock and commercially available, i.e., at least 500 of them must have been sold.



PHOTOS COURTESY OF MIDWEST PRODUCTS & DAN PARSONS

First-place winner of the Midwest T-6 class at the 1995 Galveston Unlimited Races—Don Walters of the Southwind Flyers, Houston, TX (race no. 77). Don was sponsored by JBK Products*, and he used a Webra* 1.20 2-stroke engine and an APC* 14x12 prop.

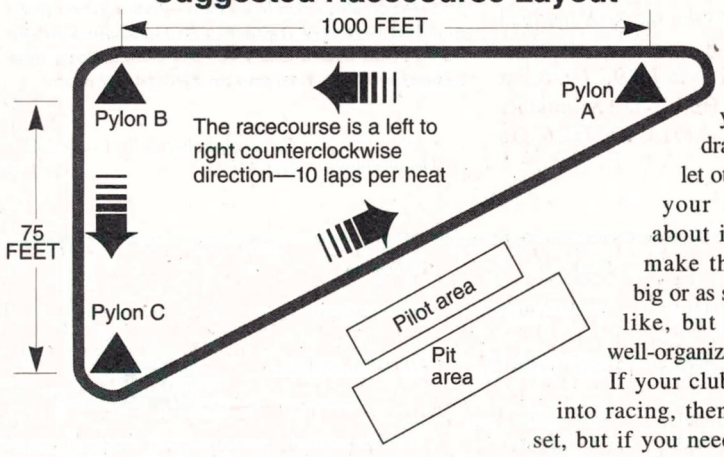
- Any glow plug, spark plug and onboard glow ignition system may be used with the engine. The carburetor and associated mounting hardware may be replaced as long as the replacement is commercially available and intended for use on an engine of 1.25ci displacement or less.
- Any fuel may be used. Chemicals outlawed by the AMA are not allowed.
- All propellers must be commercially

AT-6 Texans

by GERRY YARRISH

The fourth-place winner—Mike McConville of Midwest Products Co. (race no. 69). Mike was sponsored by Midwest, Futaba* and Horizon Hobby Distributors*, and he used a Webra 1.20 and an APC 15x8 prop.

Suggested Racecourse Layout



the paperwork to get the ball rolling. You should advertise your event locally to draw some spectators and let other clubs in your area know about it. You can make the event as big or as small as you like, but it must be well-organized.

If your club is already into racing, then you're all set, but if you need guidance, give Ed a call; he'll be more than happy to get you set up.

MIDWEST RULES

The objective of the T6RA is to promote entry-level, scale model airplane racing that is safe, enjoyable and affordable. Any AMA club or promoter can host a Midwest T-6 race. The course must be triangular and planes have to follow a left-to-right (counterclockwise) flight pattern (see illustration).

To keep the models as stock as possible, the specs are simple. The models must:

- be unmodified and built from the Midwest Products AT-6 Texan kit;
- have fixed or retractable gear and a tire size of at least 4 inches;
- weigh at least 14 pounds dry;
- have at least one pilot figure in the cockpit;
- have aircraft race numbers prominently displayed—at least 3½ inches high on both sides of the fuselage or vertical fin and at least 4½ inches high on the lower, right wing surface near the tip;
- be structurally sound and suitable for racing.

Also, to add nose weight and realism, a dummy engine is encouraged. Fiberglass cowls and wing cuffs are acceptable if they are the same size as the original kit parts. There are no restrictions on color schemes or aircraft markings; original and scale racing designs are encouraged. There is no "builder-of-the-model" rule.

available and at least 14 inches in diameter and no more than 12 inches in pitch. Factory logos or brand name markings must be visible. Props may be reworked in any other way.

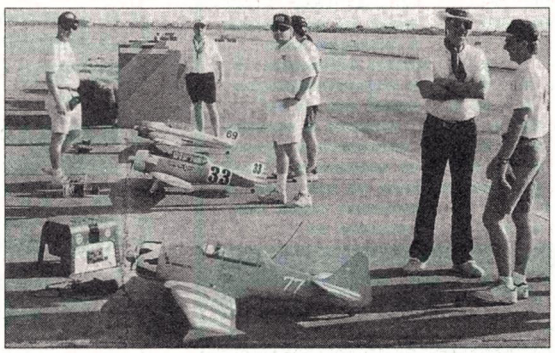
A scale spinner like this one from Tru-Turn* is required for Midwest T-6 racing.

- Any muffler that can be 90-percent enclosed in the cowl is acceptable. No straight pipes or tuned pipes are allowed.
- Fuel pumps, fuel metering devices, mixture controls, muffler and crankcase pressure are allowed.
- A scale spinner is required.

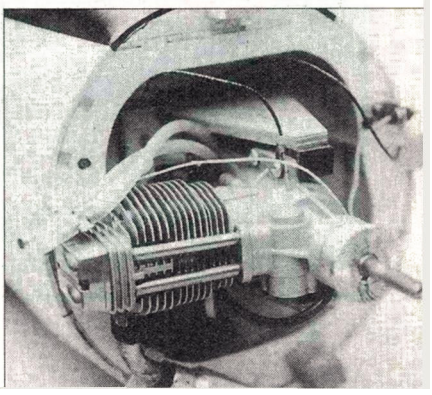
The C-J Racing Team—Charles Jackson (left) and James Colyer of Seabrook, TX (race no. 458). They used a Webra 1.20 and an APC 14x12 prop.

RACING IN YOUR AREA

So, you like the idea of less expensive racing, you have a suitable flying site, and you have a number of pilots who have Midwest Texans and want to put on a race. What do you do? Well, as a club or promoter, pick up the phone and call the T6RA, c/o Ed Rogala at Midwest Products (219) 942-1134. He'll send you

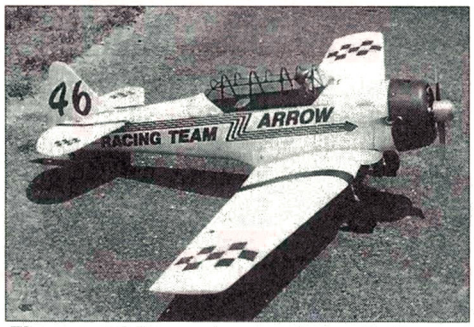


Midwest Texans in the pits ready for the next heat. From front to back, the models belong to Don Walters, Mike Hamock and Mike McConville.



Keeping the class stock means using a normally aspirated 1.25ci (1.20cc) displacement 2- or 4-stroke engine; no straight or tuned pipes allowed.

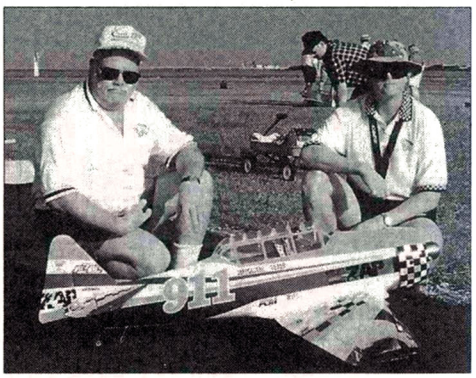
RACING MIDWEST AT-6 TEXANS



The second-place winners—James Butler and Norm Walker of the Arrow Racing Team (race no. 46). James and Norm were sponsored by the Arrow Trucking Co., and they used a Webra 1.20 powered by a 15x8 APC prop.

Each heat race consists of 10 laps and is scored individually. There are no qualifying heats for positioning. Just bring your model and race; it's simple and fun.

The excitement of the Reno-style Madera and Galveston racing is based on the Reno Race format. AT-6 Texan racing isn't just for the "big guys" anymore. You, too, can get the adrenaline rush that comes from hugging the pylons and jockeying for the number-one slot with your Midwest AT-6—and at a fraction of the cost! Racing can be had right in your backyard. Check out what the T6RA has to offer, and before your know it, you'll be off to the races. A national Midwest T-6 race is set for September 28 and 29, 1996, at Scobee Field in Houston, TX; contact Bobby Etheridge at (713) 277-0086. Go fast and turn left!



The Beach Boys Racing Team—Frank Tiano (left) and Pat McCurry (race no. 911). Sponsored by Zap*, Penn Credit and FTE, the Beach Boys flew behind a Webra 1.20 and an APC 14x12 prop.

** Addresses are listed alphabetically in the Index of Manufacturers on page 131.*

Galveston Results

Pos.	Pilot	Race no./Team	Engine/Prop	Fuel	Sponsors
1st	Don Walters	no. 77/Southwind Flyers	Webra 1.20/APC 14x12	JBK Products	JBK Products
2nd	James Butler/ Norm Walker	no. 46/Arrow racing	Webra 1.20/APC 15x8	Cool Power 15%	Arrow Trucking Co.
3rd	Harold Norfalise/ Bram DeGidts	no. 11/Flying Dutchman	Webra 1.20/APC 15x8	Ritch's Brew 10%	n/a
4th	Mike McConville	no. 69/Team Midwest	Webra 1.20/APC 15x8	Omega 15%	Midwest Products, Futaba, Horizon Hobby Distributor
5th	Mike Hamock	no. 33	n/a	n/a	n/a

A LOOK AT WHAT OUR READERS ARE DOING

SEND IN YOUR SNAPSHOTS

Model Airplane News is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable. We receive so many photographs that we are unable to return them.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1996. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897-3035.

WINNERS

Throughout the year, we receive so many great entries that it's very difficult to narrow it down to three winners, but we finally settled on the top three. Congratulations to the winners, and we thank all of you who sent us pictures of your pride and joy.

1ST PLACE

This outstanding Bellanca Aircruiser was built by Bill Smallwood (right), and it was test-flown by Bill Pottage in Abbotsford, B.C., Canada. The wingspan is 130 inches, and it's powered by a Quadra 50 gas engine. Using photos and line drawings, the model was scratch-built with spruce and foamboard, and it was covered with Sig Coverall. Congratulations, you've won $500!

2ND PLACE

It took Charles Valentino of Lake Ronkonkoma, NY, six months to scratch-build this Douglas Skyraider. He used Nick Ziroli plans for the 1/6-scale model, which produced a wingspan of 100 inches. It's covered with 1/8-inch-thick planking, Super Coverite and spray paint, and all the markings are hand-painted. Except for the canopy, the details are handmade. The plane that this Skyraider was modeled after served in Vietnam aboard the *U.S.S. Intrepid*. This is truly a beautiful model. Congratulations, Charles! Your one-year subscription to *Model Airplane News* and a set of Air Age Publishing model-aviation books are on their way.

3RD PLACE

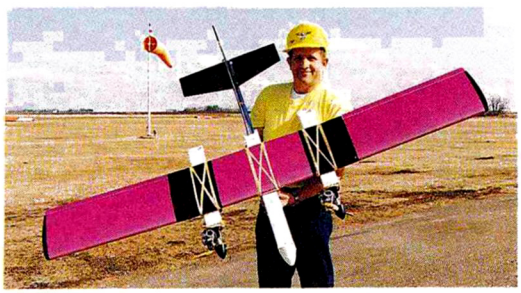
This beautiful, 84-inch-span Fokker DVII was built by Joe Parrott of Knoxville, TN. He used Joseph Nieto drawings to scratch-build the 17-pound, balsa-and-plywood model, and he covered it with Superfabric and hand-painted the lozenge pattern. Vinyl screen-printed ink markings, antiquing and fuel-proofing complete the finishing process. The 8-inch wheels were taken off a wheelchair, and the tires were made out of a radiator hose. The dummy Mercedes engine and pilot figure were also scratch-built out of balsa and basswood. An exquisite masterpiece. Great job, Joe. You'll receive a one-year subscription of *Model Airplane News* and a set of Air Age Publishing model-aviation books.

BRITISH BEAUTY

Karl Vermandois of East Hampton, NY, sent some shots of his exquisitely detailed S.E.5a. This ¼-scale model is scratch-built using Dennis Bryant plans, and it's easy to fly, very stable and maneuverable. Karl powered the plane with a SuperTigre 3000, and he used a Futaba Super 7 radio. It's covered with Sig Coverall and dope, and it weighs 20 pounds, 5 ounces. This absolutely gorgeous model took a long time to build. At first, Karl was reluctant to fly the S.E.5a; can't imagine why!

FLOATING RACER

The inspiration for this beautiful Schneider Cup MC-72 came from a 1993 article in *Model Airplane News*. Donald Madison of San Diego, CA, scratch-built this 60-inch-span, 7-pound model using the centerfold photo! The all-balsa, fiberglass-covered plane is painted with Formula-U Bright Red epoxy and trimmed with MonoKote gold. It's powered by a K&B .61, and it sits on a set of 36-inch Stream floats. Don tells us that the first flight will take place soon; we hope it's a big splash (figuratively speaking, of course)!

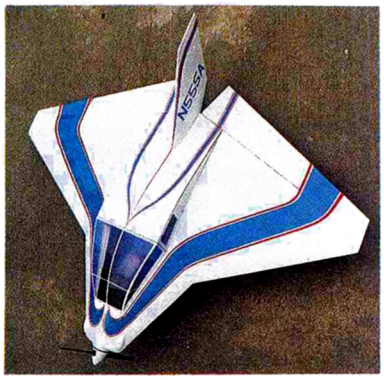


DOUBLE TROUBLE

Jeff Liedl of Rochester, MN, sent us a photo of his redesigned Sturdy Birdy by Hobbico. Jeff added the two PVC engine pods, which house two O.S. .40 FP engines and Goldberg retract mechanisms for the main gear. He modified the fuselage to accept a Goldberg nose-gear retract mechanism, and he added a spinner to the front for a more aerodynamic look. The plane has a wingspan of 74 inches, and it uses eight servos, including three on the retracts. This plane, which has been flown successfully, brings new meaning to the words "kit-bashing."

RETIRED AEROBAT

Everything is big in Texas—even Jerry Farr's 80-inch wingspan, stick-type airplane. Jerry uses a World Expert radio in his creation and powers it with a Maloney 1.25ci engine that has a C&H ignition. He says that the pilot looks like him, and that the AARP logo is a big hit at fly-ins. Jerry tells us that it flies well but it isn't a speed demon. It's probably one plane that he won't want to retire.



DELTA REPLICA

Laddie Mikulasko of Dundas, Ontario, Canada, sent us some photos of his scale Dyke Delta. Built entirely of balsa, it's powered by an O.S. .26 4-stroke engine. It has a 40½-inch wingspan, and it uses mixing for the elevon controls. This model has also been flown with an Astro 15 geared motor, and Laddie tells us that with either engine, it flies the same as a conventional-looking model.

PADDLEFOOT

This B-24J slope ship, built by Gregory Matson of Milpitas, CA, uses modified plans of a Dave's Aircraft Works D-model. The plane is a stand-off, fun-scale model of the B-24J that Greg's dad flew in as a tailgunner. He completed 35 missions, including the first daylight raid on Berlin. Greg's 47-inch-long version has a 72-inch-span, foam-core wing, and it has functional flaps, bomb-bay doors, two wing-mounted bomb drops and flashing strobe lights. It has been flown in 22mph winds. A nice tribute to your dad, Greg.

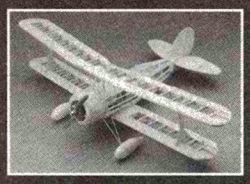
PRODUCT GUIDE

by DEBRA SHAR

Almost Read

IF YOU enjoy flying more than building (or your time and/or space are limited), but you don't want to take a "cookie-cutter" model to the field, an almost-ready-to-cover (ARC) model may offer you the best of both worlds. It's a way to obtain a prebuilt model that will look unique and allow you to call it your own.

Whether you're looking for a slope soarer, a warbird, or an aerobatic sport plane, you'll find it in this comprehensive guide to the most popular ARCs on the



Model Tech Great Lakes

market today. These handcrafted models have been built, aligned, sanded and shaped, and most come with a hardware package. After a minimum of benchwork, you need only to install your favorite powerplant and radio and cover and balance the model. You'll be at the flying field with a custom-finished knockout before you know it. And don't worry; we won't tell anyone you didn't build it all yourself if you don't!

ARC PRODUCT GUIDE

Aeroworks

MODEL NAME	TYPE	LENGTH	WINGSPAN	WING AREA	APPROX. WEIGH
Laser 200	Scale aerobatic	80 in.	98 in.	1,620 sq. in.	17 to 21 lb.
Edge 540	Scale aerobatic	91 in.	102.5 in.	1,865 sq. in.	22 to 25 lb.
Profile Extra 300	Aerobatic	63 in.	72 in.	1,440 sq. in.	8 to 9 lb.

Altech Marketing

Haigh Super Star	Aerobatic	40 in.	53.25 in.	540 sq. in.	5 to 6 lb.
Giant Beech Musketeer	¼ scale	71.75 in.	96 in.	1,248 sq. in.	16 to 18 lb.
Super Stearman	Aerobatic bipe.	47 in.	54 in.	822 sq. in.	7.5 to 9.5 lb.
Pilatus Turbo Porter PC-6	STOL	52 in.	72 in.	720 sq. in.	6 to 8 lb.
F-14 Tamecat	Trainer	50.25 in.	72.25 in.	794 sq. in.	5.5 to 6.5 lb.
Zlin Akrobat	Aerobatic	43 in.	54 in.	540 sq. in.	5 to 6 lb.

Cermark

F-20	Sport scale	66.5 in.	56.5 in.	756 sq. in.	7.5 lb.
Islander	Sport scale	57 in.	72 in.	792 sq. in.	8 to 9 lb.

Direct Connection R/C

Ultimate 10-300S	Aerobatic bipe.	60 in.	56 in.	1,065 sq. in.	10 lb.
F-20 Tigershark	Sport scale	54 in.	47 in.	535 sq. in.	5.5 to 6.5 lb.

Hobbico

SuperStar 40	Trainer	50 in.	60 in.	660 sq. in.	5.5 lb.
SuperStar 60	Trainer	56.25 in.	69 in.	880 sq. in.	7.5 to 8.5 lb.
Viper Sport	Sport/Q500	34 in.	52 in.	502 sq. in.	3.5 lb.

Hobby Lobby Intl.

Telemaster 2000	Trainer	52 in.	79 in.	875 sq. in.	109 oz.
Taurus Plus	Unlimited aerobatic.	59 in.	84 in.	987 sq. in.	172 to 206 oz.
Skimmer	Sailplane.	40 in.	70 in.	532 sq. in.	44 oz.

Hobby Shack

Lucky Stik	Sport.	47 in.	52 in.	589 sq. in.	5.5 lb.

ISC Intl.

Sean Tucker Pitts Special	Aerobatic bipe.	—	64 in.	1,360 sq. in.	15 to 18 lb.
Nutten Special	Aerobatic	40.5 in.	66.5 in.	820 sq. in.	9.25 to 10.25 lb.
Clipped-wing Cub	Trainer	62 in.	79.25 in.	1,147 sq. in.	8 to 10 lb.

Kyosho

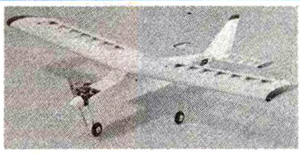
Piper J-3 Cub	Sport scale	45 in.	71.7 in.	760 sq. in.	5.5 lb.

No time to build? These 60 models will get you in the air quickly!

to Cover

Altech Giant
Beech
Musketeer

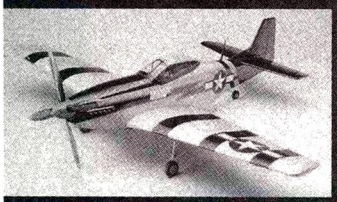
POWER REQ'D	RADIO	PART NO.	LIST PRICE	COMMENTS
3.2 to 5.8 2-st.	4-ch.	—	$695	FW; FG cowl & wheel pants
4.2 to 5.8 2-st.	4-ch.	—	$849	FW; FG cowl & wheel pants
1.08 to 1.20 2-st./1.20 to 1.50 4-st.	4-ch.	—	$159	AW; HW
.40 to .45 2-st./.53 4-st.	4-ch.	IE600	$169.98	FW; clear canopy; ABS cowl, servo covers & wheel pants; HW
1.20 2-st./1.20 to 1.6 4-st.	4 to 6-ch.	IE700	$425	FW; clear canopy; ABS cowl; HW
.60 2-st./.80 to .90 4-st.	4-ch.	IE300	$249.98	FW; clear canopy; ABS cowl; HW
.40 to .60 2-st./.53 to .80 4-st.	4 to 5-ch.	IE500	$184.98	FW; clear canopy; ABS cowl; HW
.40 to .60 2-st./.53 to .80 4-st.	4 to 5-ch.	IE800	$184.98	FW; clear canopy; ABS cowl, cockpit deck & wing tips; HW
.40 to .45 2-st./.53 4-st.	4-ch.	IE200	$179.98	FW; clear canopy; ABS cowl; HW
.60 2-st.	5-ch.	F-20RG-ARC	$345	AW; clear plastic canopy; retracts; HW
.05 motor (2)/.20 2-st. (2)	4-ch.	Islander-ARC	$325	AW; FG cowl; clear plastic canopy; HW
.60 to .90 2-st./.90 to 1.50 4-st.	4-ch.	DC8	$349.99	AW; FG cowl & wheel pants; HW
.40 to .46 2-st.	4- to 5-ch.	DC11	$225.99	FW; HW; FG air intakes & tail cone; opt. retracts
.35 to .46 2-st./.61 to .70 4-st.	4-ch.	HCAA4800	$129.99	AW; HW
.60 to .61 2-st./.70 to .90 4-st.	4-ch.	HCAA4810	$179.99	AW; HW
.19 to .40 2-st.	4-ch.	HCAA5000	$134.99	FW; HW
.40 to .60 2-st./.60 to .90 4-st.	4- to 5-ch.	HLA106	$219.20	AW; HW
.60 to .80 2-st./.80 to 1.20 4-st.	4- to 5-ch.	HLSC232	$256	AW; cowl; decals; HW
Speed 600 motor/equiv.	3-ch.	HLDS003B	$99	AW
.40 to .53 2-st.	4-ch.	123620	$114.95	FW; HW
G-62/equiv.	4- to 8-ch.	—	$695	AW; HW; FG cowl & wheel pants
.90 to 1.50	4-ch.	—	$309.95	FW; HW; FG cowl & wheel pants
.75 to 1.08 2-st./.90 to 1.20 4-st.	4-ch.	—	$349.95	FW; HW; FG cowl
.40 2-st./.40 to .53 4-st.	4-ch. w/5 servos	KYOA1001	$269.99	AW; yellow plastic cowl; clear plastic canopy; HW



Hobbico SuperStar 40

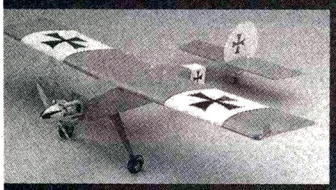
Abbreviations: AW—all wood; FG—fiberglass; FT—foam tail; FTD—foam turtle deck; FR—built-up, sheeted wings with foam ribs; FW—foam wings; HW—hardware included.

ARC PRODUCT GUIDE



Model Tech P-51

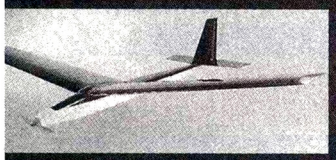
Model Tech Sukhoi



Model Tech Joss Stik

Altech F-14 Tamecat

Hobbico Viper



Hobby Lobby Skimmer

MAT

MODEL NAME	TYPE	LENGTH	WINGSPAN	WING AREA	APPROX. WEIG
Airtrax GS	Sport	72 in.	84 in.	1,300 sq. in.	16 to 20 lb.
Airtrax Aggressor	Sport	74 in.	84 in.	1,300 sq. in.	16 to 20 lb.
Airtrax 60/120	Sport	65 in.	72 in.	800 sq. in.	6.5 to 9 lb.
Airtrax 40	Sport	56 in.	54 in.	500 sq. in.	4 to 5 lb.

Model Tech

P-51D Mustang	Scale warbird	54 in.	65.3 in.	762 sq. in.	7.5 lb.
P-51 Mustang	Scale warbird	37 in.	50 in.	428 sq. in.	3.5 lb.
Me-109	Power scale sloper	36.5 in.	45.5 in.	428 sq. in.	30 oz.
P-51 Mustang	Power scale sloper	37 in.	50 in.	428 sq. in.	32 oz.
Sukhoi Su-29	Scale aerobatics	48 in.	61 in.	644 sq. in.	7.5 lb.
Dragon Lady 40	Sport aerobat	43.5 in.	52 in.	572 sq. in.	5 lb.
Dragon Lady 60	Sport aerobat	54 in.	66 in.	872 sq. in.	7.5 to 9 lb.
CAP-21	Classic aerobat	46.5 in.	59 in.	578 sq. in.	5.5 lb.
Cessna Skylane 182	Scale	56 in.	74.8 in.	802 sq. in.	8 lb.
Hurricane	Sport pattern	45 in.	53.2 in.	545 sq. in.	5 lb.
Sonic 500	Quickie 500 racer	39.5 in.	51 in.	500 sq. in.	4 lb.
Joss Stik	Trainer	52 in.	67.5 in.	877 sq. in.	8 to 9 lb.
Saphir II-4T	Pattern	—	74 in.	1,112 sq. in.	8.8 to 9.2 lb.
Calypso	Pattern/sport	56.5 in.	64 in.	730 sq. in.	6 to 7.5 lb.
Great Lakes	Aerobatic bipe	34 in.	47 in.	585 sq. in.	5.5 to 6.5 lb.

Pica/Robbe Inc.

Rubin	Pattern	71.625 in.	72.75 in.	946 sq. in.	8.75 lb.
Saphir 1	Pattern	63 in.	70 in.	853 sq. in.	7.5 lb.

Precision Aviation Design

⅓ Laser 200	Aerobatic	80 in.	98 in.	1,600 sq. in.	9.75 lb.
Ultimate 10-300	Aerobatic bipe	77.5 in.	70.5 in.	1,685 sq. in.	10 to 12 lb.
⅓ Davis Acro Pro 1	Aerobatic	82 in.	98 in.	1,710 sq. in.	10 to 12 lb.
37.5% One Design	Aerobatic	77 in.	88 in.	1,412 sq. in.	9 lb.
25% Extra 300	Aerobatic	74.5 in.	80 in.	1,113 sq. in.	15 to 17 lb.
30% Extra 300	Aerobatic	86 in.	98 in.	1,600 sq. in.	18 to 22 lb.
37% Extra 300S	Aerobatic	98.5 in.	107 in.	2,274 sq. in.	16.5 lb.
37% Extra 300S Quique	Aerobatic	103.5 in.	107 in.	2,274 sq. in.	17 lb.
33% Lanier 300S	Aerobatic	71.5 in.	102.5 in.	1,868 sq. in.	20 to 25 lb.

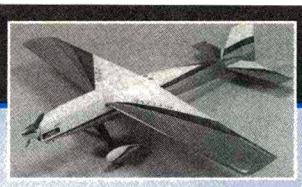
R/C Air Models

G-Shark	Sport aerobatic	64 in.	84 in.	1,144 sq. in.	14 to 16 lb.
G-Shark Mk II	Sport	66.5	84 in.	1,202 sq. in.	15 to 18 lb.
Citabria	Sport scale	67.75 in.	108 in.	1,586 sq. in.	16 to 18 lb.
Laser 200	Sport	68.75	87 in.	1,257 sq. in.	15 to 18 lb.

Tower Hobbies

Tower Trainer 40	Trainer	50 in.	60 in.	660 sq. in.	5.5 lb.
Tower Trainer 60	Trainer	60 in.	56.75 in.	877 sq. in.	7.5 to 8.5 lb.

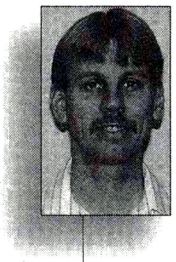
Addresses are listed alphabetically in the Index of Manufacturers on page 131.



MAT Airtrax

POWER REQ'D	RADIO	PART NO.	LIST PRICE	COMMENTS
1.8 to 4.4 glow/gas	4-ch.	MATAGS	$549.95	FW; wood cowl; ABS cowl & wheel pants; HW
1.8 to 4.4 glow/gas	4-ch.	MATATAGR	$699.95	FW; FT; wood turtle deck; ABS cowl, wheel pants & canopy; HW; tools
.61 to 1.20 glow	4-ch.	MATAT12	$275.95	FW; wood cowl; ABS cowl & wheel pants; HW
.40 to .46 glow	4-ch.	MATAT4	$185.95	FW; wood cowl; ABS cowl & wheel pants; HW
.60 to .90 2-st.	5- to 6-ch.	123645	$340	AW; HW
.25 to .28 2-st.	4-ch.	123640	$129.95	AW; HW
—	2-ch.	123638	$115	AW; molded canopy; HW
—	2-ch.	123635	$115	AW; molded canopy; HW
.60 to .65 2-st./.60 to .90 4-st.	4-ch.	123690	$340	FW; FG cowl, belly pan & fairing; HW
.40 to .53 2-st./.60 4-st.	4-ch.	123660	$189.95	FW; FG cowl & wheel pants; windscreen; HW
.60 to 1.20 2-st./.90 to 1.60 4-st.	4-ch.	123650	$270	FW; FG cowl & wheel pants; windscreen; HW
.40 to .60 2-st./.60 to .90 4-st.	4-ch.	123632	$200	FW FG cowl & wheel pants; HW
.60 to .90 2-st./.90 to 1.20 4-st.	5-ch.	123680	$495	FW; FG cowl; ABS wheel pants; clear windows; HW
.40 to .53 2-st.	4-ch. w/5 servos	123780	$170	FW; molded canopy; LG
.25 to .40 2-st.	4-ch.	123750	$106	FW
.60 to 1.08 2-st./1.20 to 1.60 4-st.	4-ch.	123770	$205	FW; FG leaf-spring tail wheel; HW
1.20 4-st.	5- to 6-ch.	123790	$510	FW; FG cowl; clear canopy; leaf-spring tail wheel
.40 to .75 2-st./.60 to .90 4-st.	5- to 6-ch.	123760	$280	FW; clear canopy; basic HW; leaf-spring tail wheel; HW
.45 to .53 2-st./.65 to .70 4-st.	4-ch.	123685	$215	AW; FG cowl; ABS wheel pants; HW
1.20 4-st.	5-ch.	—	$469.80	FW; epoxy/glass tuned pipe; cut retract wells; canopy
.60 2-st.	5-ch.	—	$419.90	FW; epoxy/glass tuned pipe; cut retract wells; canopy
2 to 4.2 2-st.	6-ch	—	$1,195	FR; foam turtle deck; FG cowl & wheel pants; HW
3 to 4.2 2-st.	9-ch.	—	$1,600	FR; FG cowl & wheel pants; HW
3 to 4.2 2-st.	6-ch	—	$1,325	FR; FTD; FG cowl & wheel pants; HW
2 to 4.2 2-st.	6-ch	—	$995	FR; FTD; FG cowl & wheel pants; HW
2 to 3.3 2-st.	6-ch	—	$1,250	FR; extra foam in sides & bottom; FG cowl & wheel pants; HW
2 to 4.2 2-st.	6-ch	—	$1,400	FR; extra foam in sides & bottom; FG cowl & wheel pants; HW
5.8 to 7 2-st.	9-ch.	—	$1,800	FR; FG cowl & wheel pants; HW
5.8 to 7 2-st.	9-ch.	—	$1,900	FR; FG cowl & wheel pants; HW
3.2 to 5.8 2-st./3.04 4-st.	4-ch.	—	$1,600	FW; FG cowl & wheel pants; HW
SuperTigre 2500 to 3000/equiv.	4-ch.	—	see dealer	FW; FG cowl & wheel pants; clear plastic canopy; HW
SuperTigre 3000, Quadra 42/equiv.	4-ch.	—	see dealer	FW; FG cowl & wheel pants; clear plastic canopy; HW
.90 2-st. to Quadra 35/equiv.	4-ch.	—	see dealer	FW w/ alum. spars; FG cowl & wheel pants; clear plastic canopy; HW
SuperTigre 3000/equiv.	4-ch.	—	see dealer	FW; FG cowl & wheel pants; clear plastic canopy; HW
.35 to .46 2-st./.61 to .70 4-st.	4-ch	TOWA1002	$99.99	AW; HW
.46 to .61 2-st./.48 to .70 4-st.	4-ch.	TOWA1012	$139.99	AW; HW

Abbreviations: AW—all wood; FG—fiberglass; FT—foam tail; FTD—foam turtle deck; FR—built-up, sheeted wings with foam ribs; FW—foam wings; HW—hardware included.



by MIKE LACHOWSKI

TIPS ON AIRFOILS AND THERMALLING

PICKING AN airfoil for a glider is always great for lengthy discussions. Unless you're into aerodynamics, all you really need to know is what choices are good for you. I have some suggestions for airfoils that should help when you select your next model. Most pilots don't really practice thermal soaring, so this month I'm starting a series of exercises that will improve your thermal-soaring flying skills. I also have a short report on the New England R/C Soaring Convention.

CONTEST PROPOSAL

A recent e-mail message on the RCSE—a soaring mailing list on the Internet—proposed an interesting contest. Fly the same airplane with several different airfoils, and identify the airfoils. Thinking about how to tell the differences between airfoils in flight brought to mind the kind of advice I might give someone trying to decide on what airfoil to pick for a new model. First, we need some characteristics to classify the airfoils. A simple way is to select airfoil thickness and camber as a rough measure of performance. This is a simplification of the real analysis. I think it works to stick to modern computer-generated airfoils.

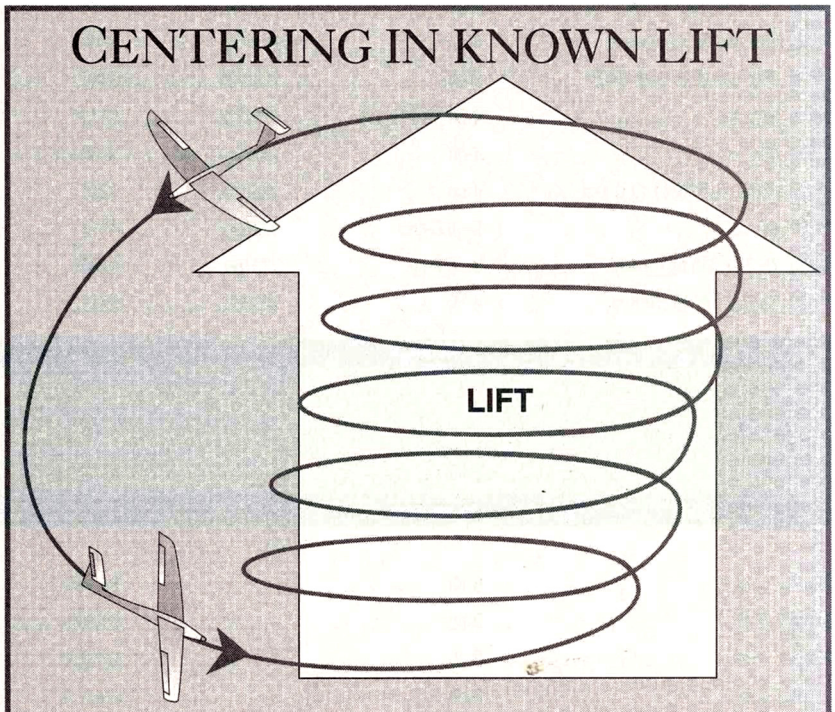
AIRFOIL CATEGORIES

I've divided thermal airfoils into four categories.

• Thick, high-drag sections, such as the E214 and many of the older sailplane airfoils, are often 12-percent thick with a camber of more than 3.5 percent. For the most part, these include older thermal competition airfoils, which are good for beginners and high-aspect-ratio scale models. They slow down well in flight, and their thickness makes it easy to build strong wings. Before anyone screams about their performance, remember that these sections generally do perform well, especially in larger models with higher wing loadings, but if the wind is up, trying to get some ground speed can be like pushing rope.

• General-purpose thermal airfoils are preferred by most pilots because they're easy to use for thermal flying. The E193 and E387 are some notable examples. Probably the most popular right now is the SD7037. The nice part is that they're thin enough (under 10 percent) to produce speed and penetration into the wind while still maintaining quite a bit of camber (over 3 percent) and good low-speed performance. Put these airfoils in any kind of lift, and you should be able to go up. Sometimes reflex can help a little on speed, and camber can help slow down the model in flight.

• The most challenging airfoils are those commonly used in F3B models—airfoils such as the RG15 and S7012. These airfoils are thin—9 percent and sometimes less. They also have a lower camber, typically under 2 percent. This type of airfoil can move quickly when searching for lift or when traversing sink. Get the nose down, and you can head quickly to the other side of the field without a great loss of altitude. The weak point is thermalling. With some use of camber, an expert pilot can thermal gliders with these airfoils quite well, but most pilots don't have the skills to work weak lift. Recognizing lift takes more practice, and the signals from a faster model are more subtle.



When you've almost reached the top of the thermal, leave the lift and take a look around. Then descend to about 1,500 feet using the airbrakes to help manage descent rate and speed. Now, level off, find the thermal that you have just departed, center in it, and climb back up.

Good pilots know how to find thermals fast. After finding one, they center the thermal quickly. How do you practice these skills?

Take advantage of the thermal you're flying in. When you have quite a bit of altitude, use your flaps or spoilers, and lose some altitude. You'll need to get out of the thermal to lose altitude quickly. Now go back and re-center that thermal, climbing back up.

Besides honing your skills in locating known thermals and centering, you may also pick up a better understanding of the structure of thermals. You'll also practice safe descents from altitude.

Pilots who try an RG15 airfoil for the first time often wonder what happened to all the lift.

• In between the high-lift thermal airfoils and F3B airfoils are those for the average pilot who likes to fly in all wind and lift conditions. The E205 was popular, but it was replaced by the S3021. One of the airfoils that has been appearing more frequently in thermal flying is the SD7080. I flew one for a while on a NSP Sparrow, and it thermals quite well even though it's a slope glider. Recently, I flew an Inventec Esteem with the SD7080. The airfoil slows down and thermals quite well, and it moves much faster than a model with an SD7037. The SD7080 is a pretty good choice for a pilot who wants a thermal model that's fun and fast.

MAKING THE CHOICE

What's the right choice for you? Right now it's hard to beat the SD7037 for an AMA-style, thermal-duration model, which is the airfoil I flew last year on a Skyhawk and a Spectrum. Flying the SD7037 is not as much fun as flying an SD8000, but task times aren't much of a problem in light lift. In case you haven't tried, the SD8000 is great for outside loops and inverted thermalling. If you want a little more zip, go for something like the SD7080. You can find a few thermal models on the market now with this airfoil. For real speed, pick the RG15 or S7012. Until you get used to these airfoils, lift will be difficult to achieve.

I also expect airfoils to improve in the future. Refinements in the shapes will continue, but there are problems with how to accurately reproduce the airfoil. I expect to see improvement in the use of flaps, camber-changing and multiple airfoils blended together spanwise. The results might not translate directly into a better glide; instead, you'll see higher launches and better handling in flight. Both of these add up to longer flight times. With improved composite construction, very thin airfoils can be produced. The Monarch series of hand-launch gliders uses very thin airfoils that change from the root to the tip. The latest WACO Magic also uses a thin 6-percent airfoil. If you're looking for an airfoil that's different from the ubiquitous Michael Selig designs and RG-15, check out the MH-32 or HN227.

INTERNET AIRFOIL DATA SITE

This airfoil data site now has more than 1,000 airfoils: http://opus.aae.uiuc.edu/~selig/ads.html (Web page). It includes both full-scale and low Reynolds number model airfoils. By the time this is printed, the site should also include some search capabilities so you can find the airfoil you want for your project.

THE NEW ENGLAND R/C SOARING CONVENTION

Last November, the Down East Soaring Club put together another great soaring convention. The expanded facilities included displays by the manufacturers.

The talks covered a wide variety of R/C soaring topics. Bill Kuhlman talked about flying wings, Dave Garwood about intermediate slope soaring and Pat Flynn about cross-country soaring. I began the afternoon session with a discussion on thermal soaring. Ed Slegers shared his experiences about electric gliders, and Jerry Slates talked about scale modeling. Jim Armstrong finished up the day with a talk about the construction of the Down East winch-line retriever.

There was also a raffle featuring a number of items from the sponsors. The Canadian contingent had purchased the most tickets, and they had collected quite a few items. The highlight of the raffle was a Stylus from Airtronics*. Other sponsors included Aerospace Composite Products*, B²Streamlines*, California Soaring Products*, Major Hobbies*, R/C Soaring Digest*, Slegers International*, SR Batteries*, The Birdworks* and Viking Models, USA*.

The weather the day before and after the convention was uncooperative, but some pilots still braved the cold and light rain on Sunday to do some slope flying.

**Addresses are listed alphabetically in the Index of Manufacturers on page 131.* ✚

Sepp Uiberlacher's award-winning

Hawker Tempest

Sepp Uiberlacher is justifiably proud of his superb Hawker Tempest with which he won both the High Static and Best Craftsmanship awards at the 1995 Top Gun Invitational scale shootout in Florida. This model, built to exactly 1/6 scale, has a wingspan of 83½ inches and a dry weight of 22 pounds.

by MIKE CHERRY

A masterpiece of scale accuracy and detail

IT TAKES a very special model indeed to win both the coveted High Static and Best Craftsmanship awards at the prestigious Top Gun Invitational scale competition held at West Palm Beach, FL—an event that has become almost an annual pilgrimage for scale enthusiasts from all over the world. Sepp Uiberlacher achieved this extraordinary feat with his Hawker Tempest at the 1995 competition, and this article sets out to describe his incredible model in detail.

WHO'S SEPP?

Sepp Uiberlacher was born in Austria in the mid 1940s and has been living in Canada for the last 30 years. A modeler for more years than he cares to divulge, the last few of these he has spent designing many super-scale models (generally from the 1940s and '50s) with which he has achieved consid-

From the perfectly accurate hand-stitched harness and oxygen mask to the miniature zipper on the flying jacket, this is one of the most realistic looking pilots I've ever seen. Parts of a DGA pilot were used, and the clothing and many other bits were custom-made by Sepp and his wife.

erable contest successes. Many of these models are now available as semi-kits from his company Advanced Scale Models* in the U.S. and from his distributors in other countries.

SEPP'S TEMPEST

His remarkable Hawker Tempest Mk.5 (Series 1) model, which took him around 3,000 hours to complete, is to exact 1/6 scale (wingspan—83 1/2 inches, length—67 inches, dry weight—22 pounds). The color scheme and markings are perfect miniaturized replicas of those that were on an aircraft in New Zealand's 486 Squadron, which unfortunately no longer exists. Originally based in Great Britain, the squadron eventually moved to Holland as the tides of WW II turned in favor of the Allies.

Sepp's construction drawings for this model are almost a work of art, including many superbly drawn auxiliary views and details, and they wouldn't look out of place hanging on your living-room wall. The design was scaled from copies of original factory drawings, ensuring exact scale outlines, 3-views and details, such as the undercarriage and cockpit areas, from the well-known Arthur Bentley drawings, available through Bob Holman Plans*.

SPECIFICATIONS

Scale: 1/6

Wingspan: 83 1/2 in.

Length: 67 in.

Weight: 22 lb.

Engine: Moki 1.8

Propeller: Zinger 18x8

Radio: Futaba 7UAP

Retracts: self-designed and scratch-built; pneumatically powered

Construction: traditional balsa and plywood

Finish: tissue and dope finish with custom-mixed HobbyPoxy paint

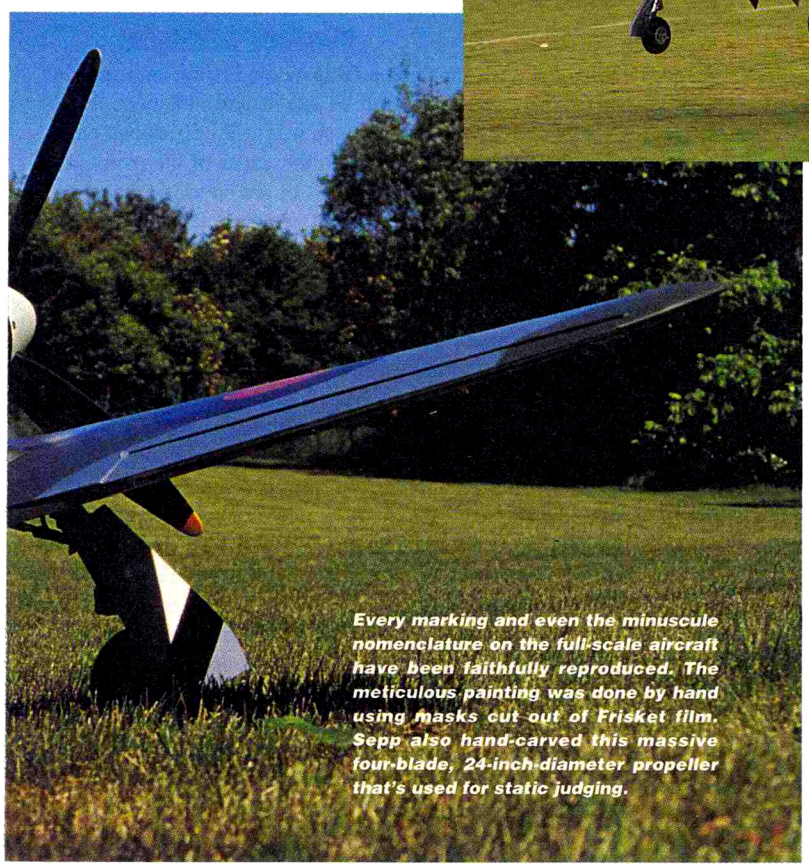
Comments: Sepp won the High Static and Best Craftsmanship awards at the prestigious 1995 Top Gun Invitational with his Hawker Tempest, which took him 3,000 hours to complete. The Tempest features exact-scale flying surfaces with scale-size hinges and hinge lines, including the very large, four-section split flaps. A precise representation of the terrifically complex main undercarriage and retract mechanism was machined by Sepp out of solid and tubular aluminum sections, which were mostly aircraft-grade 6061. Sepp says the model is an absolute dream to fly.

AIRFRAME

The airframe is mainly of traditional built-up construction, using balsa and plywood formers, ribs and stringers with 3/32-inch balsa sheeting on the fuselage and 1/16-inch balsa for the wings and stabilizers. Composite materials were used in a few areas where additional strength was needed, such as the special carbon-fiber elevator joining mechanism and flap torque-rod linkages. To keep the weight down, the entire aircraft was covered with traditional tissue and non-shrinking dope, although lightweight fiberglass cloth and laminating epoxy/polyester resin could be used for greater "ding" resistance at the expense of a little extra weight.

The engine bay is encapsulated by a massive, one-piece, removable fiberglass cowl (included in Sepp's semi-kit), which makes maintenance on the engine bay an extremely easy task. With such a short nose moment, some additional weight in the nose was always going to be a necessity as well as the 1 1/2 pounds of lead. Both the main 1200mAh flight pack and onboard glow battery are also housed in this area to balance the model correctly. A Jomar* electronic onboard glow unit was used to switch the system on at throttle settings below about one-third power. Sepp's model used a SuperTigre* S2500 for Top Gun, but it has since been re-engined with a Moki* 1.8 to give some additional "grunt" and vertical performance. A Zinger* 18x8 propeller was used on both motors, the Moki turning it 1200rpm faster than the SuperTigre.

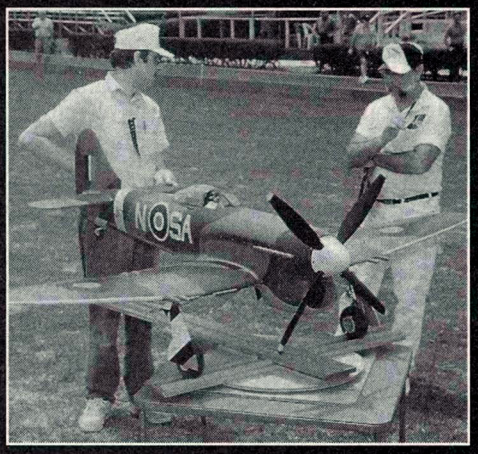
The Tempest at Top Gun '95. Sepp says it's a great flier, and it always lands with some flaps cranked down.



Every marking and even the minuscule nomenclature on the full-scale aircraft have been faithfully reproduced. The meticulous painting was done by hand using masks cut out of Frisket film. Sepp also hand-carved this massive four-blade, 24-inch-diameter propeller that's used for static judging.

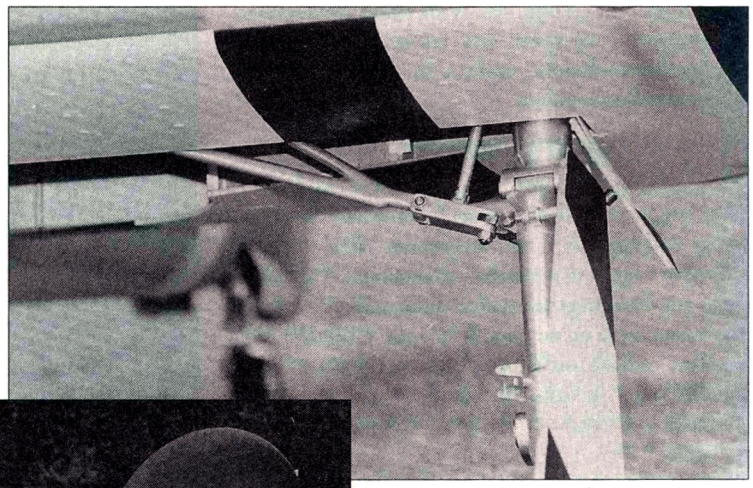
SCALE ENGINEERING

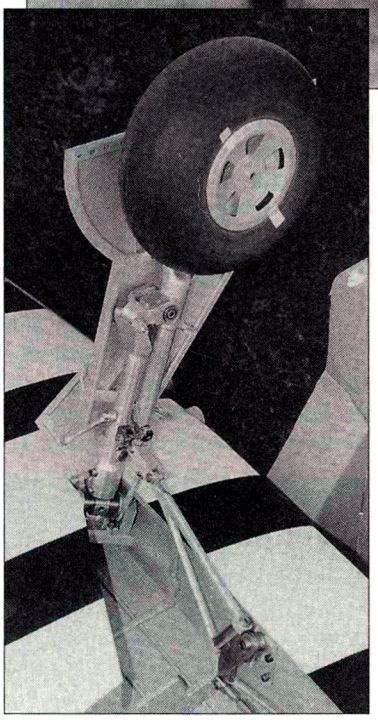
The Tempest features exact-scale flying surfaces with scale sizes and hinge lines, including the very large, four-section split flaps and—probably the most impressive part—a totally precise representation of the terrifically complex main undercarriage and retract mechanism, which are of the levered suspension Oleo type. This beautiful piece of engineering, which could be a complete article on its own, took Sepp more than a month of constant work to complete. The mechanism was machined by Sepp from solid and tubular aluminum sections (mostly aircraft-grade 6061) and with some steel parts where extra strength and wear resistance were needed. The tubular rear leg encloses a sprung and damped suspension system that's cantilevered to the main undercarriage leg as it is on the full-size aircraft,



SEPP'S KIT

As stated, semi-kits are available for this particular version of the Hawker Tempest, which includes the comprehensive construction drawings, molded and vacuum-formed parts, fiberglass cowl and tail fairing and cockpit canopy. The drawings detail the exact-scale undercarriage, as shown here, and also the installation on a semi-scale set of pneumatic retracts and Oleo struts, which are also available. The model is designed for engine capacities of between 1.5 and 2.5ci, and all-up weights will vary between 18 and 22 pounds, depending on the amount of scale detailing and the engine size.

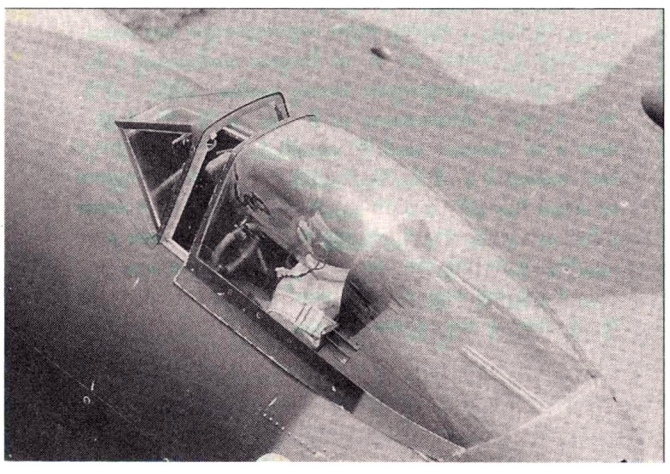




The retractable main undercarriage, Oleo struts and wheels are a real work of art. Sepp machined them out of solid aluminum and steel to duplicate the full-size aircraft's complex levered Oleo-type suspension. Notice also that the gear uses a scale-actuation mechanism, which even includes the miniaturized torque and drag links to the doors. The wheel hubs were also turned by Sepp and, of course, the internal surfaces of the wheel bays and the gear doors are fully detailed and riveted!

and it provides authentic and excellent ground handling. Retract actuation of each main leg is by a single, large Robart* pneumatic cylinder. All three wheel hubs were machined of solid aluminum. The mains used Du-Bro* 5½-inch-diameter smooth contour tires, and the tail wheel used a homespun foam rubber tire. The steerable, retractable tail-wheel unit is also completely homemade and pneumatically actuated.

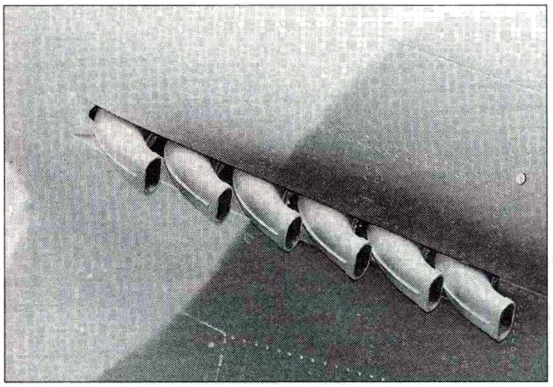
Many of the more elaborate scale details, including the exhaust pipes, the clear wing, the tail-navigation light covers and the wheel-hub disks, were molded of plugs that Sepp made (these are all included in the kit) with a product called TXP, which he says is similar to Lexan but better for this particular process. The beautifully clear cockpit canopy was also molded of TXP and, of course, it slides back authentically in Sepp's award-winning model, revealing the astonishing cockpit detail. The instrument faces were made of photographs of the actual instruments, with homemade bezels, switches and levers. The realistic pilot figure uses a DGA* head, feet and lower body, with a helmet and goggles made by Sepp and the upper torso, clothing and harness all custom-made by his wife, Rosemary.



The sliding canopy is flawless. Notice the weathering on the sides of the canopy frame and the abundance of handcrafted fasteners and rivets.

SURFACE DETAILING

The quality of surface finishing on this model is truly amazing, and it looks extremely authentic from all angles and directions. Every single panel, inspection plate and hatch was faithfully drawn on the fuselage and wings and masked up to the edges of the panel lines with PVC tape. Then several light coats of automotive primer were sprayed along the edges of the tape before it was removed, leaving the necessary raised area. After the whole model had received a light priming coat, but before the final paint was applied, the complete airframe was "riveted." Every rivet was applied individually with a sharpened, hardened steel tube (about 3/32 inch in diameter) that was pushed into the tissue/dope surface to a precise depth and then turned to create the thousands of flush rivets. Sepp made his own special tool to simplify and speed this process; it set the depth of the rivets and the exact spacing between them. The many hundreds of Dzus fasteners and screw heads were then added, each of these individually made by punching them out of aluminum and then punching the small slots in the screw heads by hand! Although there are a couple of companies that manufacture these miniature fastenings, Sepp says he saved both weight and money by making them all himself, and he also gained a great deal of satisfaction! The roundels and markings were added (hand-painted, of course), and then the whole model was painted using HobbyPoxy* paints. Sepp mixed the colors to the exact



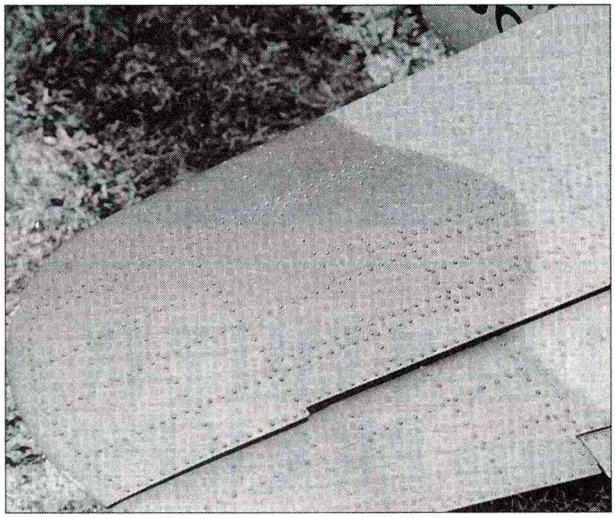
This view of the portside exhaust stacks (vacuum-formed by Sepp) and the rivet and fastener detailing around the huge molded fiberglass engine cowl indicate the massive effort put into the construction of this super-scale model.

shades of the original aircraft; final clearcoat wasn't added as this epoxy-based paint is completely fuelproof.

SETUP AND FLYING

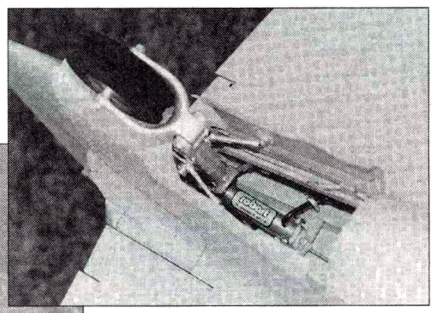
The Tempest only requires a normal 6-channel radio for operation, but Sepp used a seventh channel to control an optional in-flight mixture control. Futaba's* equipment was used with its high-power coreless servos on major flying surfaces and standard servos on the throttle and in-flight mix. Sepp says the model is an absolute dream to fly, especially with the more powerful Moki engine and that he uses no fancy mixing functions with his Futaba 7UAP transmitter. In fact, the model is so well-behaved in flight that he doesn't even have elevator trim mixed in with the flaps when they're deployed, as there is negligible pitch change. Landings in particular are really simple, although he hasn't tried any "flapless" ones to date.

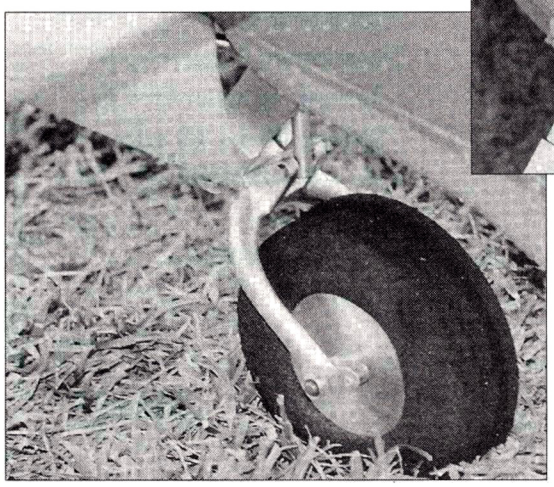
Sepp Uiberlacher has just completed his latest super-scale model—a Mk.16 Spitfire. On the drawing board and nearly complete is a Hawker Typhoon, the prototype of which has already flown, and coming soon is a Hawker Hurricane. Watch for his latest masterpieces on the U.S. scale circuit in 1996.



Sepp says that there are about 25,000 rivets on the model (both the flush and raised type) and that it took him three weeks of full-time work to complete it. That's more than 300 hours just for the rivets. What a labor of love!

**Addresses are listed alphabetically in the Index of Manufacturers on page 131.*





Like everything else on the model, the tail wheel and the working tail wheel doors are a work of art. The tail wheel operates using a Robart pneumatic air cylinder.

Golden AGE OF R/C

by HAL deBOLT

EARLY R/C IN SAN FRANCISCO

A Mustang club flying session. Note the tripod-mounted transmitter.

DONALD BUTMAN of Woodland Hills, CA, was kind enough to copy some material from a popular late '40s/early '50s R/C publication and send it to me. Every month, the "West Coast Model News" was eagerly anticipated by modelers who wanted to know what was happening "out West." In those days, the "Westcoasters" were on the cutting edge of modeling, so their doings were of great interest to the rest of us.

Alex Schneider wins another Nats with his Rockwood-equipped Cub.

A lot of the news concerned control line, which was in its glory, but the Westerners were also instrumental in promoting early R/C. One issue featured an article by Ed Rockwood about how one major R/C club got started in the San Francisco area. Initially named the "Mustangs," I believe the club later changed its name to the "Pioneers." You might associate the name Rockwood with the first "reed systems," but he was also an energetic promoter of early R/C. Following is a paraphrase of his article.

A radio-control club was being organized in the San Francisco area. Whether modelers were interested in planes, boats, or cars, all were welcome. They gathered to share info on how to get started, available equipment and even how to assemble and improve equipment.

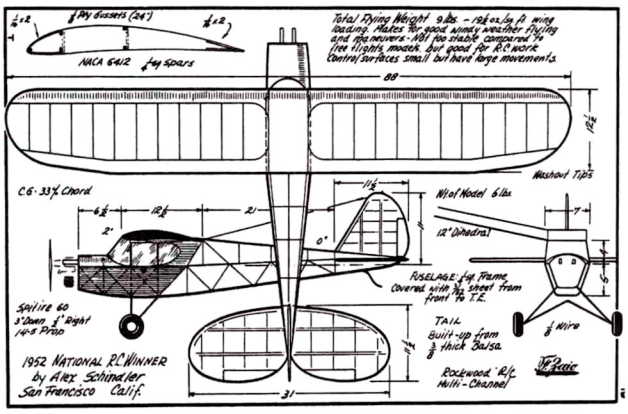
Everyone was inspired by the success stories that were shared. John Terry had a 3-channel Rockwood system in a Comet Model Company 6-foot Curtiss Robin. Right and left rudder could be commanded without a sequence as escapements require; also, engine power could be adjusted at will—quite sophisticated for the time! Joe Poco reported about his 9-foot Piper "Super Cruiser." He had a number of fine flights until mother earth caught up with his Piper. Afterward, his Forster "99" needed everything below the spark plug replaced! Why does that continue to happen, even today? Ed Rockwood also reported that a variable elevator control was being tested on his 7-foot Piper Cub. (We did eventually get elevator "trim" with reeds.) He also lent his flying field to other attendees.

I should note that most of today's R/C clubs began with free-flight or control-line activities and simply switched to R/C in due time. The San Francisco group started with R/C; so did the DC/RC club and the Aero Guidance Society.

The R/C club was successful, and C.L. Bussard noted that November 16 marked the dawn of a new era when the Mustangs offered an R/C demonstration at which four new members initiated their very first flights. Ray Regalia began with a beautiful takeoff, circled around with a few S turns thrown in and ended with a successful "power on" landing. What more could a guy ask for, even today? Understand that there were no instructors; you did it all on your own! Regalia was followed by Bussard and then by Bob McReynold, whose flight was said to be the finest of the day. McReynold astounded them by performing figure-8s, steep banked turns and even a short "spin" from which he landed within 50 feet of his takeoff position! Remember, with early R/C, you felt lucky to land on the same field you took off from!

Unfortunately, the other two newcomers had crashes. Ralph Aristo got off to a fine flight performing well for about 9 minutes until a pilot "booboo" ended his demonstration. Apparently, the Mustang members and other spectators were very impressed. A lot of credit was given to Ed Rockwood for his preflight check of the models and for providing the facilities.

Remember that most models were based on full-

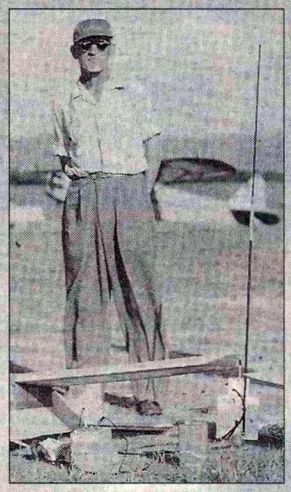


The Schneider Cub was a typical late '40s Mustang club craft.

A TRIBUTE TO FRANK SCHMIDT

Frank Schmidt of Erie, PA, was not as well-known as other pioneers of his time, yet he had a profound impact on our R/C heritage. He was a close friend of mine, and it is my privilege to pay him this tribute. Those close to him know that Frank was a down-to-earth, genial man of excellent character who left us much too soon.

An Erie native, Frank gained electronic knowledge and an interest in radio control when radio was in its infancy during the early '20s. He once dragged that '23 project out of "attic storage" for me. It was an aerodynamically viable, cabin-style model with an 8-foot wingspan. The radio was a " spark emission" type widely used in very early radio. He chose the particular design because it was the only one that was light enough to fly. The single-control rudder actuator was a simple electromagnet. The rudder included a small steel plate for the magnet to attract, and it was set for a right turn. A signal activated the magnet, creating a change to left rudder. The theory was that you watched the flight circle and signaled (or not) to obtain the desired direction of flight. Rudimentary? You bet, but possible! There were no model engines in those days, but Frank foresaw their invention.

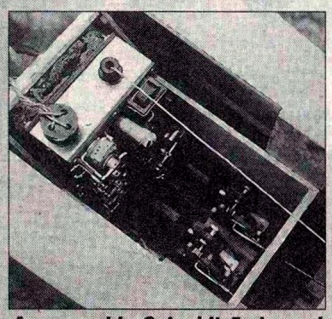


Frank Schmidt at an early R/C meet.

After he completed the project, he tried it out as a glider. He tossed it off a barn roof, and it glided about 500 feet; from these tests, it was obvious that the range of the spark-emission system was only about 200 feet. So flight control was determined to be possible, but range was a serious problem. So the model was set aside in hopes that an answer would be found in the future. Years passed, and Frank encountered some of life's ups and downs, but he always persevered. Frank Jr. followed in his father's footsteps by taking an interest in free flight and finally in single-channel R/C. His father's '23 dream realized!

When Frank Sr. became aware of Rockwood's "reed system," he was inspired and felt that it was the way to go, and he even saw room for improvement. This led to the commercial "Schmidt 5-channel" reed system, which proved to be the "hallmark" of its time. Frank and his son founded a business together, Schmidt R/C, which was extremely successful. Unfortunately, it was then that Frank discovered he was terminally ill. He devoted his time to his lifelong desire to build engines and built many gas and steam models before leaving us far too soon.

Our heritage includes so many fine people, and we are better for having known them. Frank Schmidt belongs in the fondest of our memories!



A removable Schmidt 5-channel reed receiver unit. The isolation transformer and relays are visible. Three sets of batteries were required; they weighed more than an entire system does today!

Hal deBolt and Don Waite of Pittsburgh, PA, enjoy a Schmidt-controlled flight at a '50s Nats. Note the ground-based transmitter and hand-held control box.

scale craft, and it was considered outstanding to perform a few simple flight maneuvers; in fact, to fly with any control at all was a wonder! The Mustang's Alex Schneider and many others went on to earn national recognition; Alex was a Nats champ for several years.

FROM THE MAILBAG

David Irwin of Georgetown, Ontario, Canada contacted me with some questions about the Live Wire Super Cub, which he wanted to be his first scratch-built OTR/C. What he didn't realize is that the Super Cub is nothing more than a disguised Live Wire Champion. His biggest concern was which power to use. With the early control systems, slow flying speed was a requisite; time was needed to react! So, by today's standards, most OT designs would be considered underpowered. So you might think that, today, you should juice up the power, *but* understand that aerodynamics are always consistent with the power and speed of a plane. Excess power might create a monster out of an otherwise fine performer! Dave used an O.S. .25 FP in his fine rendition of the Super Cub, and its performance impressed his fellow club members.

I also suggested that he install the wheels farther back, in line with the wing leading edge for easy takeoffs (hand launches were common, so the OT gear was mounted forward for protection during the inevitable "hard landings").

Bob Mercer of Perth, Australia, has put together an extensive R/C museum. It houses several of those renowned Orbit "black boxes," some of which have not been operated in decades, but with new batteries, they fired up instantly and operated perfectly—another feather in Bob Dunham's cap!

Mercer is one of the many who responded when I asked for encouragement for Bob Dunham when he was sick. Mercer's "hug" came from halfway around the world! Would you believe that Bob received hundreds of letters? Mercer was extremely sad to hear of Bob's death; he says we lost one of the true pioneers of R/C.

And so it was in those memorable times!

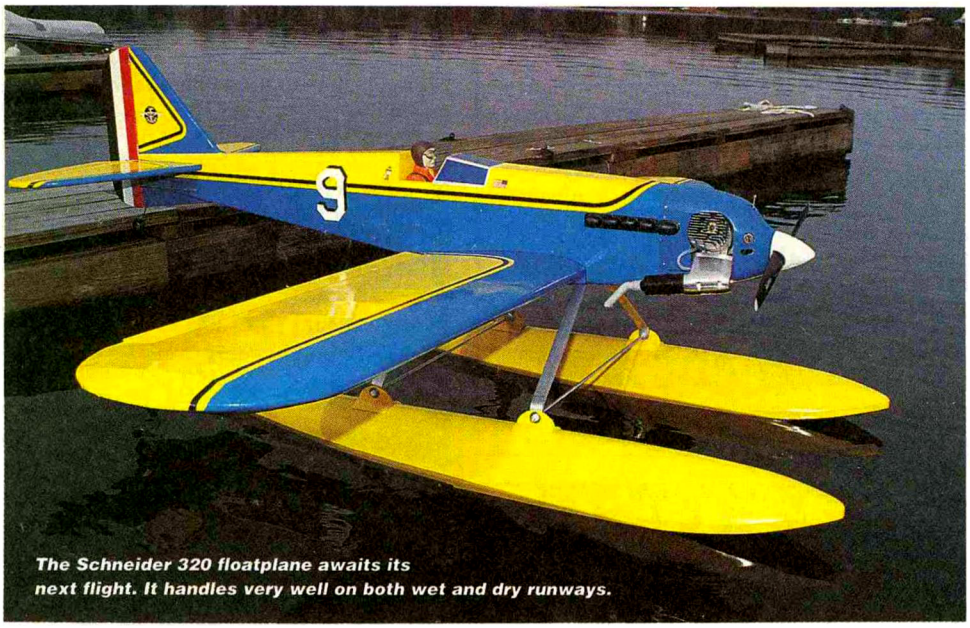
MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

A racy sport plane for land or sea

STREAM INC. Schneider 320

by JIM ONORATO



The Schneider 320 floatplane awaits its next flight. It handles very well on both wet and dry runways.

ABOUT TWO years ago, I built a Stream R/C Models* Schneider Sport 60 floatplane and flew it from a nearby lake; I was really impressed with its sleek looks and excellent flight performance. When my very good friend Dick Purdy asked if I would like to complete a project he had started, I was delighted to discover that the project was a "Field & Bench Review" of the Schneider 320 kit, which included both the landplane and the floatplane versions. Unfortunately, Dick passed away before I could finish the plane, so I would like to dedicate this review to him; he was responsible for a significant part of the Schneider's construction.

With its 85-inch wing, the Schneider Sport 320 is the largest of four Schneider sport planes manufactured by Stream R/C. The others are the 57-inch-span Sport 60, the 70-inch-span Sport 120 and the electric-powered 60E.

The Schneider Sport 320 is intended for advanced builders and fliers, and the instructions assume previous building experience. The kit is mostly balsa with some lite-ply and hardwood. The 15-page instruction booklet consists of good step-by-step in-structions and more than three dozen photos. Stream recommends the use of model assembly jigs for construction, but the instructions are for workbench, building-board assembly and are sequenced in a logical sequence. I did not use jigs and had no problem building the plane without them. The basic instructions primarily address the floatplane, but where special information or a particular procedure is required for the landplane, it is so noted.

CONSTRUCTION

For most of the construction, I used Pacer's* Zap CA and accelerator, and I used 5-minute Z-Poxy on the firewall, phenolic wing-spar tube, tail feathers and the landing-gear/float-strut mounting blocks.

Fuselage construction starts with the assembly of a box consisting of a top, sides and bulkheads. The assembly procedure is somewhat unusual in that the bulkheads are first glued to the top deck, and then the sides are added. I marked the positions of all the bulkheads and the fuse centerline on both sides of the 3/16-inch sheet-balsa top deck, which I then pinned to a flat building board. Next, I marked the fuse centerline on all the bulkheads and glued them to the top deck (except for F-2, which I only tack-glued at this time). The sides were reinforced with 1/8-inch-thick lite-ply doublers and 1/4-inch balsa stringers and then glued to the bulkheads and deck. The result was a strong, straight structure. I then set the partially completed fuse aside and built the wing.

• **Wing**—constant chord with a symmetrical airfoil. It is built in two halves containing phenolic tubes that are slid onto an aluminum-tube spar for assembly. Constructing the wing halves is straightforward, but the various steps must be followed in the correct sequence. The two wing panels are built up with die-cut balsa ribs, two spruce spars and 3/32-inch balsa sheeting in the center and on the leading and trailing edges. The ribs have construction tabs, so the wing panels can be built on a flat surface. The wing has strip ailerons and built-up wingtips that are assembled separately and then attached to the wing panels. After framing both wing panels and sheet-

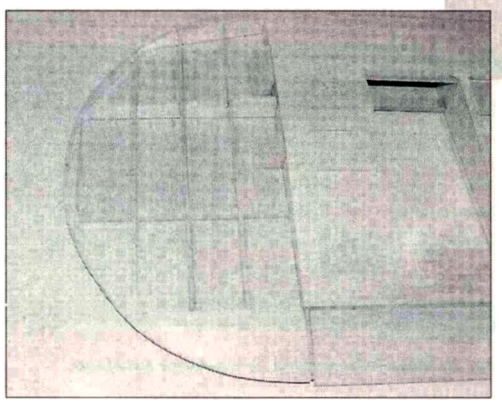
ing the upper surface, I sanded the inboard mating surfaces to obtain a flat, tight fit at the center, and I assembled them on the aluminum-tube spar. I put the assembled halves in the wing saddle of the fuselage box, which I had inverted and fastened securely to the building table.

The next steps were the most critical because they involved getting the wing halves properly joined and the float/landing-gear struts set up correctly.

The plywood mount for the front strut, the axle/strut and the rear strut-mount assemblies are all composed of a right half and a left half. Each half had to be glued to its corresponding wing panel in such a way that when the wings (which have dihedral) were put together, all the mounts were straight and level. The procedure is easier to do than to write about, but you have to follow the instructions carefully. Having properly installed all the mounting blocks, I removed the wing and installed the bottom sheeting, the capstrips and the ailerons.

• **Tail feathers.** The fin, rudder, stab and elevator were all built up with 3/8-inch stripwood and sheeted with 3/32-inch balsa. To give them a more pleasing cross-section, I tapered the trailing edges of the rudder and elevator frames before sheeting them. The plans show outlines for three styles of vertical tails: the Macchi, the Gloster and the Supermarine. The kit includes material for the Macchi, which is the one I chose. I aligned the tail feathers on the fuselage box and drilled holes for the three 1/4-inch reinforcing dowels that I inserted in the fuselage deck.

• **Completing the fuselage.** The hood and turtle deck were built up with 3/16-inch balsa formers and sheeting. On the top and bottom, just behind the firewall, I installed balsa blocks, which required quite a bit of carving. Because much of the Schneider's "look" comes from the shape of the hood and cowl area, however, this was time well-spent.



The supplied cowl is vacuum-formed ABS plastic molded in two pieces. It appeared to be adequate, but Dick had already obtained the optional fiberglass cowl from Stream, so I decided to use that one. I slit the cowl behind the engine cutout to make it easier to take off and put on. After attaching the tail feathers, I completed the fuselage by installing pushrods and bottom sheeting.

The wingtips are built separately and then added to the wing.

SPECIFICATIONS

Model: Schneider Sport 320

Manufacturer: Stream Inc.

Type: low-wing sport plane (floatplane or landplane)

Wingspan: 85 in.

Wing area: 1,321 sq. in.

Weight: 22 lb. (floatplane), 18 lb. (landplane)

Wing loading: 38.4 oz./sq. ft. (floatplane), 32.3 oz./sq. ft. (landplane)

Airfoil: symmetrical

Length: 89 in.

Radio req'd: 4-channel (throttle, rudder, elevator and ailerons)

Engine req'd: 1.8 to 3.6 2-stroke, 2.40 to 3.20 4-stroke

Engine used: SuperTigre 3000 2-stroke

List price: $395 (deluxe floatplane), $219.95 (landplane)

Comments: the fuse is made of lite-ply and balsa sheet; the tail is built up and sheeted with balsa; and the wing has hardwood spars, die-cut ribs and a constant chord with a symmetrical airfoil. Build the model as a landplane or a floatplane; it includes a vacuum-formed cowl, formed-aluminum landing gear, a 16-page instruction manual and full-size rolled plans. A set of 54-inch-long fiberglass floats and attachment struts are available separately from Stream Inc.

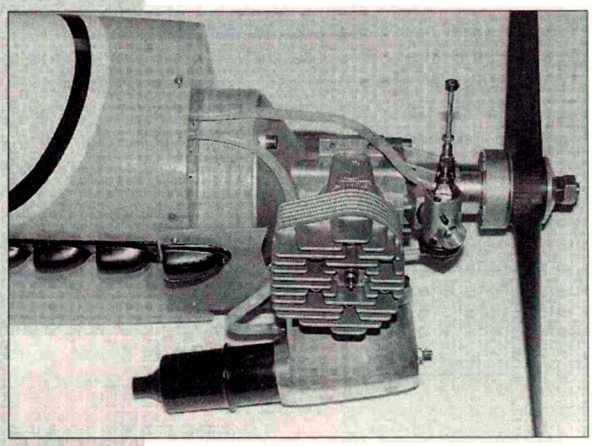
Hits

- High-quality materials and die-cutting.
- Good overall appearance.
- Smooth, docile flier.
- Excellent fiberglass floats available.

Misses

- Nothing major, just fairly heavy construction.

• **Power.** When I mounted a SuperTigre* 3000, I tilted it to avoid having to cut out the cowl's upper contour and losing the "Schneider look." I also placed the J'Tec* muffler completely outside the cowl, thereby minimizing the size of the cutout required. Incidentally, the J'Tec muffler produced a very pleasant sound that measured less than 93dB at 9 feet. To achieve proper balance, I installed the servos about 6 inches farther forward than shown on the plans.



The SuperTigre 3000 and J'Tec muffler make a good quiet powerplant combination for the 320. Scale performance can be expected, but for a more aerobatic performance, consider using a larger engine.

• **Floats**—a high-quality, streamlined, low-drag, fiberglass float set designed by Stream especially for the Schneider Sport 320; they are manufactured by Fiberglass Masters. They have a single visible joint around the chine line and are sealed and tested for leaks prior to shipment. I only had to trim off some remaining flange material and fill the joint with a mixture of fiberglass resin and phenolic microballoons. Because the floats' light fiberglass skin could easily be damaged, Stream recommends that you construct a dolly/stand to set the model in when it isn't on the water.

FINISHING

I finished the Schneider with Coverite's* 21st Century fabric and spray paint. Before covering the framework, I coated it entirely with Balsarite*. This is the fifth or sixth model I have finished with this fabric, and I continue to be very pleased with the results. I used light blue and lemon yellow

FLIGHT PERFORMANCE

• Water Handling, Takeoff and Landing

The Schneider handles very well on the water without water rudders. It has so much rudder authority that it can be taxied effortlessly at a fast idle on a calm day. When a slight breeze is blowing, short bursts of power are all that are needed to make the air rudder effective enough to turn the plane into the wind.

Takeoffs from water are fun. At rest, the Schneider sits perfectly level in the water; when power is applied, it initially drops its tail but quickly resumes a level attitude as it comes up on step. At this point, full power has the Schneider skittering across the water like a hydroplane—straight as an arrow! On the first takeoff attempt, I didn't have my engine peaked, and the plane went forever without lifting off. I then realized that the ST 3000 probably wasn't quite powerful enough for the 22-pound Schneider. After I had peaked the engine, the Schneider attained flying speed after about 100 feet, and it lifted off smoothly with only slight up-elevator.

Landings are smooth and stable, but you have to keep the power on until just before touchdown. The floatplane was 3½ pounds heavier than the landplane, and it tended to drop pretty quickly when the power was cut. The approaches were made using the elevator to raise the nose and slow the model and the throttle to control climb and descent. The best landings were made with the aft bottom surface of the float level, or at a slightly positive angle of attack, so the stern of the float touched the water first.

Takeoffs with the landplane are the same as with any tail-dragger and require a little right rudder until liftoff. The technique for setting up for landing is the same as for the floatplane and results in nice three-point landings.

• Low-speed performance

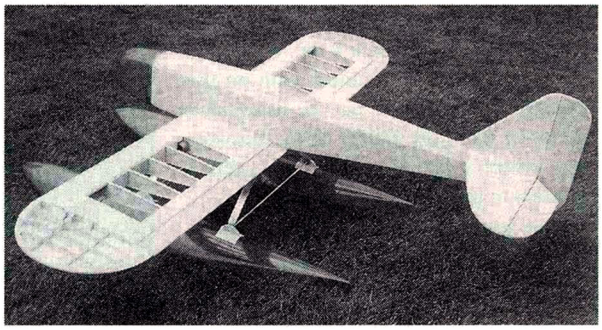
The Schneider is exceptionally stable at low speed. It has a very low stall speed, and its stalls are quite gentle and always straight ahead. That huge wing is very forgiving and allows you to fly the Schneider slowly, smoothly and safely.

• High-speed performance

With the ST 3000 at full throttle, the Schneider still didn't appear to fly very fast. Perhaps its size made it look as if it was flying slower than it really was. In any case, control response was excellent, and I did not experience any bad tendencies at full throttle. The Schneider flew very smoothly at all speeds. I doubt that you could get the constant-chord wing to tip-stall at any speed.

• Aerobatics

From having built and flown the Schneider Sport 60, I know that the Schneider design is quite aerobatic. But the limited power offered by the ST 3000 didn't really let me "wring out" the 320. It did do all the basic maneuvers, such as loops, rolls and spins; it did them slowly—but majestically. It flew quite well inverted with very little down-elevator. There was absolutely no tendency for the plane to roll out of loops. It did one huge loop after another without "falling out" of the vertical plane. Axial rolls were very slow and required quite a bit of elevator coordination. Spin entry required full deflection of all three control surfaces, but recovery was within half a spin after the controls had been neutralized. The plane is very responsive to rudder control and does a really neat four-point hammerhead. I found that the floatplane and the landplane flew equally well, although the landplane was a little faster because it weighs less. The floatplane can perform the same aerobatics as the landplane. It just does them more slowly!



The floatplane version ready for covering.

with a black, 3/8-inch accent stripe. The lemon yellow used on the floats was a good match, but the light blue used for the cowl got a little too dark when the second coat was applied.

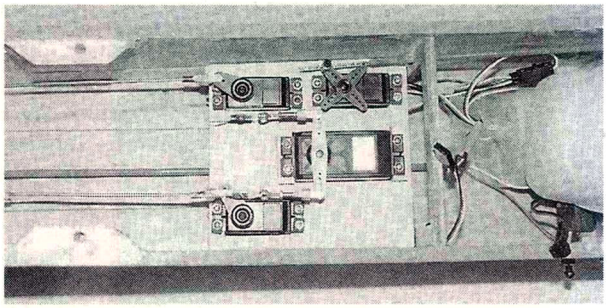
I enjoyed building and flying this airplane but regret that I didn't install a larger engine. With a 1.8ci engine, it's a very smooth, docile flier, but with more power, it would be much more maneuverable.

The Schneider Sport 320 is a high-quality, easy-to-build model that looks great on the ground, on the water and in the air. I enjoyed building and flying this airplane but regret that I didn't install a larger engine. With a 1.8ci engine, it's a very smooth, docile flier, but with more power, it would be much more maneuverable. The instructions indicate that you can use up to a 3.6ci 2-stroke engine—a size that would probably give awesome flight performance but might be difficult to fit in the cowl.

The land version of the Schneider 320.

If you love flying off water, as I do, and you're an advanced flier, you'll love the Schneider Sport 320. Just don't skimp on the power.

**Addresses are listed alphabetically in the Index of Manufacturers on page 131.*



It's easy to install the servos in the large fuselage.

Sport Fun Fly

How about a little friendly competition?

by DAN LUCHACO

Editor's note: this article also appears in the "R/C Pilot's Handbook"—another Air Age publication. For further information, see the "Pilots' Mart."

Flying R/C planes presents many challenges. After you have learned to successfully control your plane during takeoffs, basic maneuvers and landings, fun-fly contests provide a way to compare your skills with those of other fliers. Because the first word in the name of this contest is "fun," the pressure on pilots during events is minimal. At a fun fly, you may not be a winner, but there is no reason to feel like a loser. By the end of the contest, you will have learned something that you can apply to your everyday flying. In reverse, you can "practice" for a fun-fly event every time you fly at your local field. The equipment you use, your flying skills, strategy and tips on certain events all influence your performance at fun-fly contests.

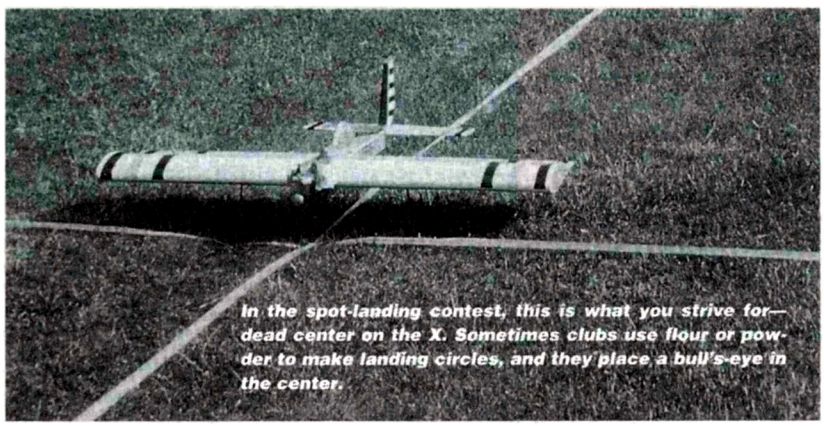
EQUIPMENT

To not "beat yourself," you need reliable equipment. Your aircraft should be trimmed for straight and level flight at all engine power ranges. The engine and fuel system should be tuned for steady performance in all attitudes of flight. The radio, servos and batteries should be up to the manufacturer's specs and fully charged.

The first step to improving your score is to get a score; the first step to getting a score is to complete the event. The radio can be set up for maximum performance by using high and low rates (or exponential) and setting the control surfaces for maximum throw. If you do not have a radio with dual rates or expo, set the surface throw for the rate of control with which you feel comfortable. Some events require fast loops or rolls, and other events require smooth flying; set up the radio and plane to cover both. Another option is to change the throw of a control surface at the control horn to maximize your plane's performance for a specific event. Increase or decrease the setting and, after the event, be sure to readjust it for normal flight.

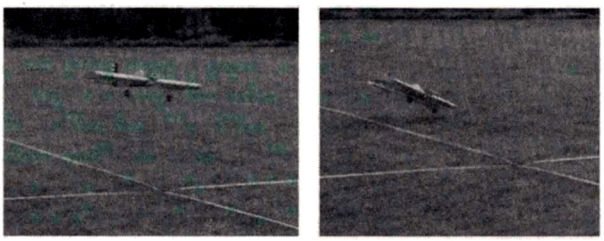
■ **Engine.** Your engine does not have to be the most powerful, high-rpm unit available. It just has to perform steadily for a complete flight. If, during the flight, you hear it lean out or sag, reduce throttle to keep it running. If you are climbing, reduce the angle of climb and continue the flight.

Before each flight, hold the plane up at a 45-degree angle and check the engine on high speed. Any change in rpm indicates a problem that needs to be solved. Adjust the needle, change the glow plug, or try different fuel. Also, check the fuel tank for a hole in a line or a pick-up clunk at the wrong end of the tank (possibly the result of a hard landing).The tuned-pipe exhaust or pump system (if you use one) must also be working perfectly to maximize your performance. (But these extras mean that more can go wrong, and they're not *necessary.*)



In the spot-landing contest, this is what you strive for—dead center on the X. Sometimes clubs use flour or powder to make landing circles, and they place a bull's-eye in the center.

PHOTOS BY DAN LUCHACO



Here is a good approach and an off-the-mark approach. To manage your altitude, keep your wings level, and use your throttle. Use the rudder for directional control.

■ **Aircraft.** Many aircraft have been designed specifically for fun-fly contests. These aircraft usually have a speed envelope of 10 to 100mph and perform well in all attitudes; they glide well, roll and loop quickly and exhibit great ground-handling characteristics.

But guess what? The plane that you have been flying for the past 50 flights is better for you to use at a contest. You are familiar with the flight envelope of this aircraft. You can fly it where you want, when you want and how you want. Most

fun-fly events are set up for standard aircraft. A 3-channel trainer and a 4-channel sport plane can perform all contest events. If your plane is not competitive in the high-speed roll/loop event, it will probably be great in the climb-and-glide or limbo event.

After you have entered or attended a few contests, you may see a design that has more capabilities than your plane. This model can be your next project. Be sure to plan about 50 flights with this new aircraft so you will be comfortable flying it. The best contest aircraft are light, durable, aileron- and flaperon-controlled, semisymmetrical designs. Most have conventional landing gear with a steerable tail wheel or skid. Iron-on covering is easy to patch, an exposed fuel tank allows quick inspection and adjustments, and oversize control surfaces provide tight maneuvers.

When trying to decide which plane to build for a contest, remember the words of Baron Manfred von Richtofen, "The crate? The quality of the crate matters little. Success depends upon the man who sits in it."

FLYING SKILLS

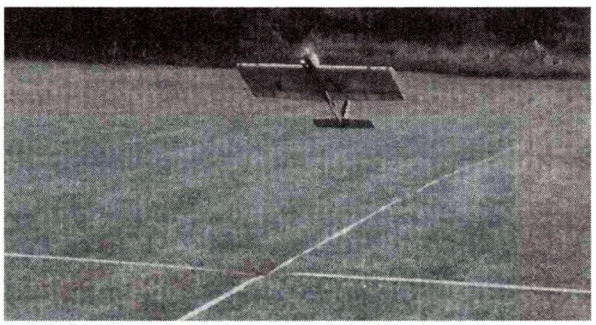
To improve your scores, practice your basic flying skills. Mark a target in the center of the runway, and use it to practice straight ground handling and takeoff control. Also use this target to sharpen your touch-and-go's and landings, and be sure to practice them in both right-to-left and left-to-right directions to imitate different runway layouts.

As your flying improves, challenge yourself to fly a tighter course while you perform the same maneuvers. Be sure to fly in both windy and calm conditions. At the end of each flight, try to land in the center of the target. If your engine stops during a flight, try to land as near to the target as possible. To practice, climb to altitude, stop the engine, glide for as long as possible, and then land on the target. You can practice this instead of just boring holes in the sky. You will be amazed at how much you can learn about your plane.

Experiment with rudder versus aileron control, elevator trim, low and high rates, thermalling for duration, side-slipping in crosswind conditions and any other skills that help you to land on the spot. A longitudinal line in the center of the runway is a good reference point when taking off and landing. Flying the length of the runway with this reference line in view will improve your ability to fly in a straight line, to line up a balloon burst, limbo, bomb drop and execute other precision maneuvers.

Another skill that you should perfect is inverted flying. Be sure to start high and work your way down. If inverted flight doesn't feel comfortable, you are flying too low! Always use the multiple-conditions scenario: left to right, right to left, calm and windy. Fun-fly events usually include these basic maneuvers: takeoff, landing, inside loop, horizontal roll, spin, glide and touch-and-go. Try to perform these maneuvers during your normal flying routine. When possible, do the maneuvers at an altitude "one-mistake high," and try to do sets of three to get used to the required controls. Your goal is to perform the maneuver as quickly as possible, or to do the most loops, rolls, spins and touch-and-go's within a set time (usually 30 seconds).

When you feel comfortable at altitude, go back and combine a routine of takeoff, flying at altitude and landing. Trim the plane for maximum performance in each of these maneuvers. Experiment with different controls for spins; try to obtain a flat spin that is easy to enter and exit. Determine how much altitude you need to recover from a spin. As you improve your flying, you will learn the limits of both your plane and your skills.



With flaperons, a slow, high angle of attack approach can land the plane right on the spot. With this technique, there is very little forward rollout.

AT THE CONTEST

So, you're at a fun-fly contest and want to maximize your scores. A few simple rules will help you do well.

■ **Have a positive attitude about your chances.** If you are not the first flier in the event, observe all those who fly before you to determine the best format to use. The mistakes that other fliers make are what you should avoid during your flight. If you are the first flier in an event, you must do your best to complete the flight and post a score that will be a challenge to the rest of the entrants. If the fun fly is set up with multiple rounds of the same events, you can use the first flight of the day to get rid of the jitters and just post a score that can be improved in later flights. Beware that adverse weather conditions can eliminate later flights, or make events more difficult.

■ **Complete a flight and obtain a score.** Because not all entrants will score during every flight, you can usually "beat" half the pilots just by getting a score. If you do not complete the flight, you have just defeated yourself. Don't be afraid to ask other entrants for suggestions on an event. (Remember the word "fun" in the contest name.)

In every round that you fly, try to maximize your score in at least one event, and then concentrate on the other events. The events at the contest can be "plane" events (loops, rolls, spins) or they can be "pilot" events (spot landings, touch-and-go's, limbo). If you do a "plane" event a couple of times and your score doesn't improve, you have probably reached your max and should put your efforts into the other events. Until you ace the score on a pilot event, your score should improve with each attempt. At fun-flys, the final round is usually when many fliers earn their best score in pilot events.

EVENT HINTS

■ **Timed events.** There are three types of timed events. The first requires that you perform set maneuvers in the shortest time from takeoff to touch down. An example of this is "Ten inside loops"—takeoff, 10 inside loops and landing. The time starts as soon as the plane moves, and it stops when the plane touches down on the runway.

As you perform this flight, distance and altitude are your enemies. Perform the loops immediately after liftoff and close to the ground, and land as soon as you have finished the last loop, and you will have a good time. Such timed events are usually called "Death," "Drill," or "Suicide," because if you make a mistake, you may be in line for the "Crash Award" of the weekend!

Another timed event requires that you perform maneuvers within a prescribed time. An example of this would be "Inside loops for 30 seconds." This flight would be timed from takeoff for 30 seconds. The number of inside loops completed after 30 seconds would be your score. Again, altitude and distance would reduce the number of loops completed in the set time. Your

main goal in this type of timed event is to set parameters in your flight "window" and try to stay inside the box during the flight. If you have a helper during the flight, have him coach you for correct placement. A mountain ridge, runway markers and even clouds can be used as "window" markers.

If the event consists of maneuvers followed by touch-and-go's and then more maneuvers followed by a landing on the field, you must try to perform the maneuvers in a pattern that allows you to end the last maneuver over the runway for a touch-and-go. Do not fly all the maneuvers in a straight line away from the runway and then waste a lot of time flying back to the runway for the touch-and-go or landing.

The third type of timed event is usually set up as: climb for altitude for a set time; then perform some maneuver or glide for duration. The altitude climb is maximized by flying into the wind at all times and maintaining the most vertical angle the plane and engine can take that also provides a good speed. Hanging the plane on the prop is no good if the plane is not moving. As you climb for altitude, plan your placement at the end of the climb for optimal visual and wind-velocity conditions. Do not climb into the sun, or the sky (or a cloud) if it matches your plane's color.

If the event is "spins," plan the end of your spins over the lowest part of the flying area. If the event is dead-stick duration, plan the glide to end over the runway or target area (if applicable). Most fun-fly events require that the plane land on the runway in "flyable" condition if the score is to count. Always keep this in mind during a duration or altitude-type event.

To achieve maximum altitude, build up as much speed as possible on the runway before liftoff, because timing doesn't begin until the plane leaves the runway. If the event is spins, a flat spin will usually lose less altitude per spin.

Here's how most planes can be put into a flat spin; try this three mistakes or more high:

- Climb to altitude and cut the engine to about ¼ throttle, hold full up-elevator, full left rudder and full left aileron.
- After the plane has started a nose-down spin, move the elevator stick to full down while still holding full left rudder and aileron. The plane should begin to level out as you move past neutral elevator into the full-down position.
- When you reach full down, slowly change the aileron from full left to full right. The plane is now in a flat spin. If possible, use the throttle to speed up the rotation.
- If the plane reverses direction when you change the elevator or aileron control, stop the input just before its direction reverses. The surest way to exit a flat spin is to move the sticks back the way you came, to the full left rudder, left aileron and full up-elevator position, and then go to neutral and recover. If this does not work, try full down-elevator and high motor.
- A plane without ailerons will also do a type of flat spin; just go to down-elevator after getting into a normal spin. Do not use any flap/elevator mixing in the spin maneuver. Experiment with your plane to see what it takes to enter and exit with enough altitude to complete the flight.

■ **Target events** include bomb-drop, balloon-burst, carrier, spot-landing and limbo maneuvers. They usually aren't timed, and the goal is precision flying, not speed. Use low rate or exponential controls. Smooth and level approaches to the target at minimum speed are the most accurate.

As the announcer would say, "High and away, ball one." The plane has landed to the right of the line and too far past the X to achieve a high score.

If the event is bomb drop with a cup or stick holding the bomb, the smooth and level flight must be from liftoff to drop. To drop the bomb, try to pull vertical just before the target, and push down to fly out from under the bomb. If the vertical or down is not violent enough, the bomb will not come off. Excess speed will cause the bomb to fall forward from the point of drop.

An optional (but more risky) method of dropping the bomb is to roll inverted over the target and push down to climb vertical. *Do not* watch the bomb after the drop; fly the plane, and let the judge score the event. Wind velocity and direction can cause the bomb to drift if it's dropped from a high altitude. For best accuracy, try to drop at the minimum altitude allowed. During the approach to the target, try to line up on something on the runway before the drop area, and try to maintain a steady altitude and heading. Your main concern is to release the bomb at the correct spot near the target.

Balloon burst, carrier and spot landing require the same type of skills. Smooth and straight approaches to the balloon at a steady altitude are important. You can change only two of the variables when you get to the balloon; climb and dive, or steer in and out.

As you control the altitude, have your helper guide you in or out. If the sun is overhead during the flight, use the shadow on the ground to indicate your position. If you have to adjust altitude at the balloon, remember that a little up is usually enough, and any down is always too much! Carrier landing and spot landing require that you fly just above the runway until you reach the target, then land immediately. Slow, controlled flight is an advantage in these events. If allowed, flap or air-brake controls can help with the landing accuracy.

If the plane must stop on the target for the score to count, be ready to use rudder to steer or position the plane as soon as the wheels are on the target. If you wiggle the rudder from side to side, you can slow or stop the rollout after landing.

Limbo is another type of target event, with the ribbon and poles being the target to fly under, or in some cases, between. If the event is to fly under the ribbon, use the straight, slow, low approach. Do not try to fly just under the ribbon; fly just above the ground between the poles. The ground and the poles do not move; the ribbon moves with the wind. If the event has two ribbons and you must fly between them, fly just above the lower ribbon; it usually doesn't move because it is closer to the ground and at the more solid part of the poles. If you are allowed to stand at the inner pole, fly close to yourself to eliminate the risk of hitting the far pole, which is at the limit of your depth perception. If the event is timed for most passes in a set time, or for three passes that are as quick as possible, remember that distance equals time, and speed usually doesn't improve accuracy. The main goal in limbo is to complete the event and get a score. Don't break a plane trying to sacrifice accuracy for speed.

■ **Ground events.** Taxi or racecourse events on the ground test your ability to

control the plane at maximum speed without hitting markers or crossing lines marked on the runway. If the event involves a target, such as a balloon, it is sometimes best to close one eye and aim for the target. If you miss, continue past the target, and then aim for it on the return pass. A long, straight approach is more accurate than a circular or zigzag attempt.

Most two-wheel planes can be made more stable on the ground by adding tail weight. Low rate or exponential control on the rudder channel can provide more precise steering on ground-type events. Spend some time driving around on the ground to learn your plane's ground-handling limits. When it is too windy to fly, remove the wing and practice your taxiing skills.

LUCK EVENTS

Some fun-fly events are "luck" events that give all contestants a chance to win, regardless of flying skill or equipment. If the event is "hidden spot landing" or "be in the air when the bell rings," luck is the only way to win. If the event is a 2-minute timed flight, you can improve your time counting by tapping your foot while you fly.

If you keep the throttle at a steady speed and fly a simple rectangular pattern, you should be able to count to within 15 seconds and then land on the runway. If the event requires a touch-and-go or another maneuver during the time, concentrate on counting while you fly the maneuver, or estimate the time it will require to perform the maneuver, and count for the balance of the flight.

If you can fly passes up and down the runway, just count for one circuit and then fly as many laps as are required to cover the time, with time allowed for landing. Multiple rounds of flying this event will allow you to adjust the number of laps to improve your score. Watch and time other fliers to see how long it takes for their takeoff, maneuvers and landing, and use this information in your flight.

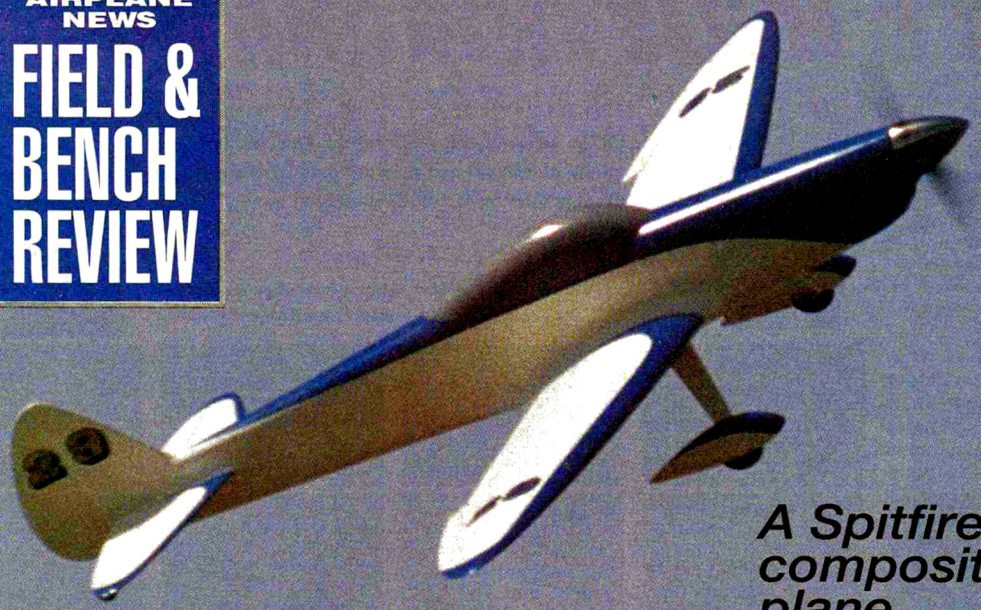
Another luck event is trying to hit a ribbon that has been dropped at altitude. In this event, try to fly through the ribbon while you fly the plane straight away from yourself, or while you fly straight at yourself. Close one eye to narrow your field of vision while you aim at the ribbon. Do not waste time trying parallel passes at the ribbon. Other luck events require that you perform some type of non-flying game, such as throw dice until you get doubles, or draw cards until you get a pair, run across the field with a prop, etc., then start your plane and complete some type of flying event.

The flying part of the event usually requires that you start the engine and complete a circuit of the field. The way to improve your luck in this event is to have your equipment ready and tuned for a quick start and flight. Be sure your radio trims are correct before you start the event. In most cases, the winner of this luck event will be the pilot who had his engine start quickest, and who flew the most direct course around the field. Most of the luck came from good preparation, not from the ability to draw the right card or to run fast across the field.

You have entered a few fun-fly contests and want to enter the winners' circle at the next event. Check your equipment, set up your aircraft, practice your flying skills, and try to learn tips about specific events. The chances are good that you will reach your goal. Your success will depend on the effort you invest. Have fun; and good luck at your next fun-fly contest!

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW



A Spitfire-inspired composite sport plane

Cogswell Engineering

Ellipse

by ROB WOOD

SPECIFICATIONS

Model name: Ellipse

Type: advanced low-wing sport plane

Manufacturer: Cogswell Engineering

List price: $349 plus $20 S&H; video—$15

Wingspan: 71 in.

Wing area: 729 sq. in.

Wing loading: approximately 35 oz./sq. ft.

Flying weight: 10.5 to 11 lb.

Length: 65 in.

Engine req'd: .75 to 1.08

Engine used: ASP* .75

Radio req'd: five channels with 8 servos (2 aileron, 2 elevator, 2 flaps, 1 rudder, 1 throttle)

Kit construction: 65-percent prebuilt fiberglass (wing skins, fuselage, spars, wheel pants); balsa tail.

Comments: the Ellipse is a well-engineered, beautiful sport plane that combines the looks of a racer with the performance characteristics of an aerobatic trainer. Because most of the fabrication work has been done, the model is well-suited to the modeler who has an eye for beauty and a shortage of building time.

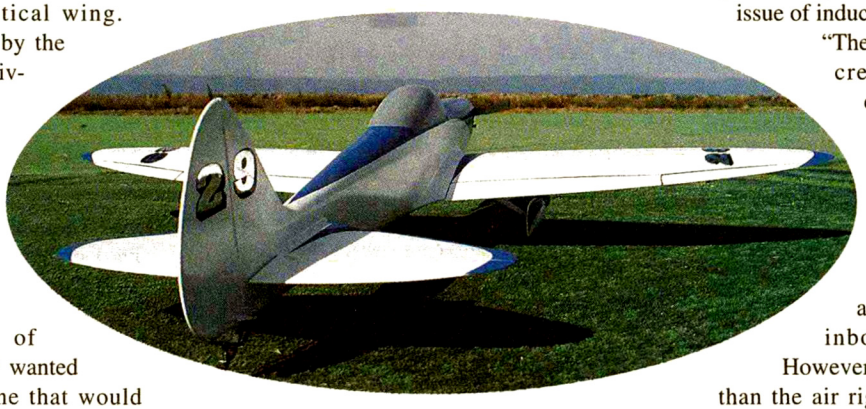
Hits

- Beautifully engineered fiberglass parts.
- Excellent performance (with sealed hinge gaps).
- Excellent design and preformed elliptical wings.

Misses

- More details would enhance the drawings.
- Detailed instruction manual would be helpful.

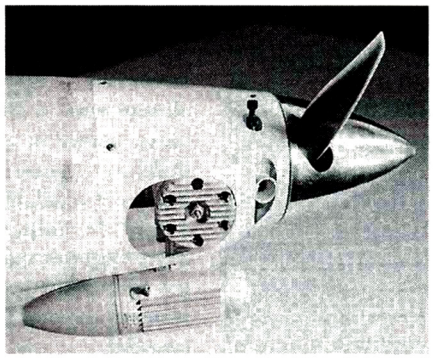
THE SUPERMARINE SPITFIRE was one of the best fighters to see action in WW II. It owed its success to a number of factors, including its powerful Merlin engine, its small airframe and its most distinctive feature—a lightly loaded, elliptical wing. Although outmatched by the BF 109 in climbing, diving and level speeds below 20,000 feet, the agility and stability of the Spitfire allowed it to take on the best the Luftwaffe could throw at it.



Steve Cogswell of Cogswell Engineering* wanted to design a sport plane that would capture the best attributes of the Spitfire and provide a solution to the troublesome challenge of building an elliptical wing—one of the reasons the Spitfire is a somewhat uncommon model at typical club fields. The fruit of Steve's labor is the Ellipse. Although it isn't a scale model, it captures much of the feel and flying characteristics of the famous "Spit." Why build an elliptical wing? According to engineer Christian Anderson of MIT, the elliptical wing was designed to address the issue of induced drag:

"The bound vortex on a wing creates tip vortices, one extending rearward from each wingtip, as you probably know. The direction of the circular component of the vortices is up if you are outboard of the wingtip and downward if you are inboard of the wingtip. However, the vortex affects more than the air right near the tip, and the result is a downwash of air (the downflow 'side' of the vortex) behind the wing along the whole wingspan."

Anderson went on to say that the effect of this downwash is to introduce a downward velocity component to the air flowing over



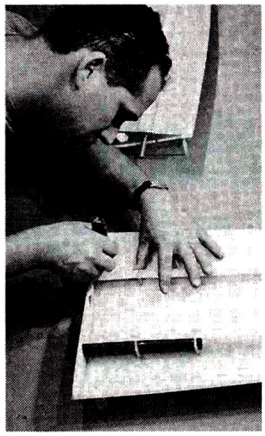
The Ellipse was designed around the ASP .75 2-stroke glow engine. The cowl fits nicely into place and makes engine access very easy. The firewall is easy to install because a locator shelf has been molded into the fuse.

System 3 Paint System

The Ellipse was painted with Nelson Aircraft Co.'s* System Three water-reducible epoxy paint. It's environmentally safe and includes primer and primer activator, many paint colors and an epoxy clearcoat and clearcoat hardener. When we finished painting, we cleaned up with a garden hose.

the wing, creating lift not only on its surface (enabling the airplane to fly), but also in a slightly rearward direction, thus slowing the aircraft down. This rearward "downwash" is called induced drag, and although all wings have an induced drag component, some designs minimize it more efffectively than others.

The designers of the Spitfire had experimented with various wing planforms and had discovered that the elliptical shape tends to evenly distribute the downwashed air coming off the trailing edge—the most effective means of reducing induced drag. Modern aircraft wing design has improved on the efficiency of the elliptical wing with the use of more efficient airfoils, leading-edge slots, flaps and a host of other mechanical devices; but the Spitfire wing was the simplest and most effective design of its time. Of course, other considerations, such as increasing the chord to make room for machine guns, landing gear, a straight spar, etc., also played a part in the choice, but the result was certainly one of the most beautiful wings ever built.



The Ellipse comes with beautiful, factory-formed, composite wing-skin panels. All the internal wing components are first installed in the lower wing half, and the top skin is glued into place. The finished wings are light and strong.

FLIGHT PERFORMANCE

My good friend and test pilot Bryan Keil put the Ellipse through its paces.

• Takeoff and landing

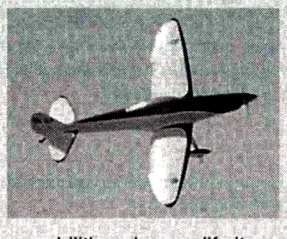
The airplane tracks down the runway well with good rudder authority at ½ throttle. ⅓ right rudder was required for takeoff—a problem that can be corrected with right thrust. ROG was at less than 50 feet, and climb-out was predictable and smooth. Landing without flaps was a little hot for a short field, but with flaps, the Ellipse slowed to a crawl and floated gently to the ground with no elevator input, except for final flare.

• Low-speed performance

Without the flaps lowered, the Ellipse snapped hard to the left prior to stalling. With flaps, the stall speed was decreased dramatically, with much less tendency to snap prior to stalling. At straight-and-level slow speed, Bryan dropped the flaps, and the airplane pitched upward very slightly. At slow speed with flaps down, the ailerons provided plenty of authority, and Bryan was able to fly the airplane around the field at a crawl.

• High-speed performance

This airplane likes to fly fast. It looks like a racer, and it tracks like one. The rigid and exceptionally strong wings and airframe suggest that it would be more fun to fly it with an engine larger than the ASP .75 we installed. The engine performed flawlessly, but at 12 pounds (1 pound over the recommended weight), the aircraft would perform even better with a .90 to 1.08. The airplane tended to pitch up at higher throttle settings, so 1 or 2 degrees of downthrust are recommended.



• Aerobatics

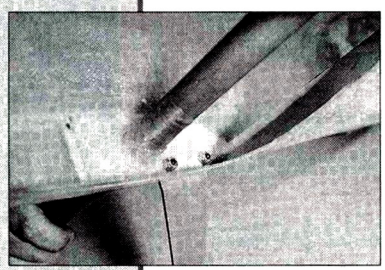
Although the Ellipse's design gives it the look and feel of a modified WW II Reno-style racer, its performance capabilities also qualify it as a basic aerobatic competitor. Though not in the same class as an Extra 300S, it nevertheless flew the basic IMAC pattern without difficulty. It would benefit from 1 or 2 degrees of right thrust, however, because Bryan was forced to use quite a bit of right rudder to effectively fly through the pattern.

- **Inverted flight:** required ½ down-elevator.
- **¾ loop, square backside:** loop easily held, straight tracking.
- **½ Cuban-8:** acceptable (slowed down a bit abruptly at the top).
- **Immelmann turn:** acceptable, but again, a little slow at the top.
- **Two-point roll, 3 seconds:** crisp aileron reponse, straight tracking.
- **½ reverse Cuban-8:** excellent tracking and crisp roll.
- **Inside loop:** acceptable, a little slow at the top.
- **Hammerhead:** full authority throughout the maneuver, straight tracking.
- **Humpty Bump with a pull, ½ roll down:** beautiful throughout.
- **Knife-edge:** ½ rudder to maintain attitude.

Note: with moderately wide hinge gaps, the airplane exhibited very poor flying characteristics. But after we had sealed all the gaps with tape, the airplane flew beautifully. If you have a model that has disappointing flight performance, try sealing every gap; you might be surprised at the results.

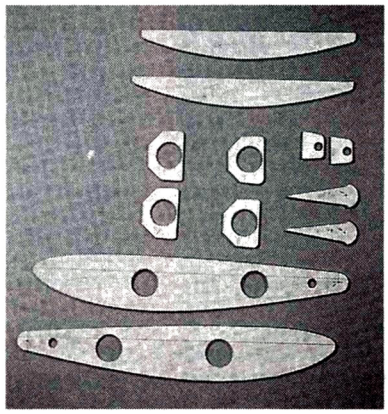
THE KIT

Cogswell's Ellipse kit has some great features, not the least of which are a completely pre-shaped and pre-stressed composite wing and fuselage. Each wing



The aluminum-tube wing joiner bonded into place with fiberglass in the fuselage. Notice the plywood doublers bonded into place on the inside of the wing root; the landing-gear attachment bolts go through the plywood doublers.

panel includes a separate top and bottom skin laid up in a mold and ready to be joined. Each airfoil section that comprises the plug from which the skins were molded was computed with a 15-percent airfoil so that the entire wing surface, from root to tip, works to minimize drag. Very little construction is required, because the main components are factory-built. This eliminates the tedium of shaping and sheeting the elliptical wings and guarantees that the wings will maintain the correct airfoil; it also requires minimal support structure between the skins.



The few wooden parts for the hollow wing.

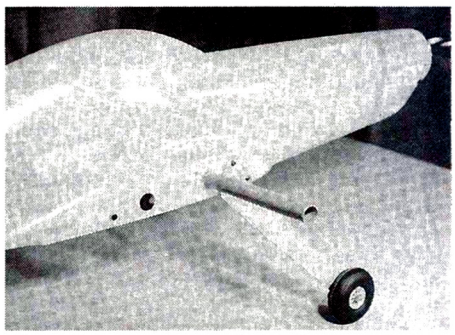
slip during flight an adversely affec aileron throw. A littl more detail in th drawings and a instruction manu would be helpfu Steve Cogswell reac ily admits this an plans to remedy th situation.

Though the kit i not intended for th novice builder, it i well-suited to th average builder wh has slightly better-than-average flyin skills. With a little thought and care, you' end up with a high-tech, composite aircra that has the speed, grace and agility of Spitfire.

Although the Ellipse's design gives it the look and feel of a modified WW II Reno-style racer, its performance capabilities also qualify it as a basic aerobatic competitor. Though not in the same class as an Extra 300S, it nevertheless flew the basic IMAC pattern without difficulty

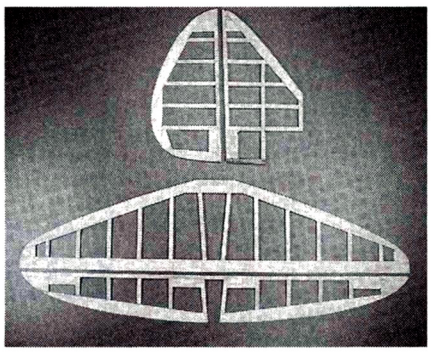
VIDEO INSTRUCTIONS

Although the kit comes with excellent drawings, there is no instruction manual. Instead, Cogswell offers a construction videotape for an extra $15. Although it's roughly edited and lacking step-by-step instruction, builder Jeff Obertelli stated that the video does highlight the important assembly steps and supplies enough basic information for a modeler with modest building skills to complete the project relatively quickly. Some of the construction details, such as sub-trailing-edge control-surface covering and fabrication of the aileron leading edges, are left to the builder to engineer. In addition, we found that pins used for hinging between the aileron and flaps had to be glued into place, because they tended to



Here, the almost completed fuselage is up o the gear. The wings simply slide into the joine tubes and are bolted into place.

** Addresses are listed alphabetically in the Inde of Manufacturers on page 131.*



Traditionally built over the plans, the tail feathers are made of wood and sheeted with balsa.

Other elliptical reading subjects

For more information on the development of the elliptical wing, try these books:

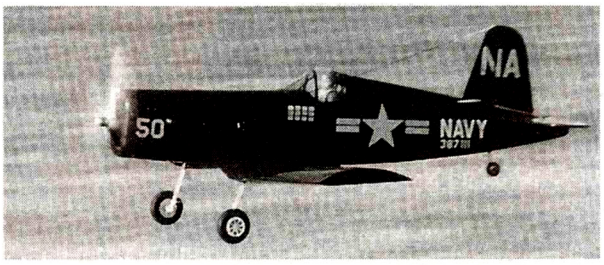
Morgan, Eric B. and Shacklady, Edward. ***Spitfire: The History***. Key Publishing, 1987.

Barnard, R.H. and Philpott, D.R. ***Aircraft Flight***. Longman Scientific & Technical, England.

ELECTRICS

by TOM HUNT

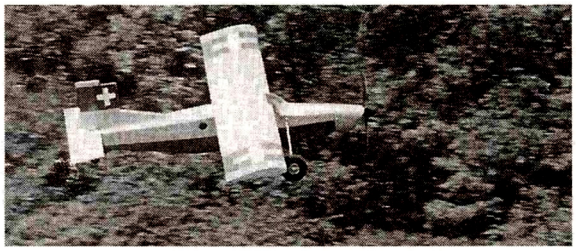
TIPS TO CONVERT GLOW KITS TO ELECTRICS



Steve Anthony's Dynaflite* Corsair (most Dynaflite kits make excellent glow-to-electric conversions). Very scale-like flight performance; no modifications except for installation of electric power system. Astro 25; 1.7:1 geared; 15, 1500mAh cells; 82 oz.; 569 sq. in.; 20.75 oz./sq. ft. wing loading.

ALTHOUGH electric models have been around since the 1970s, the reluctance of the major model companies to enter the "larger" electric model community has forced serious electric modelers to continue to find good flying electric models made from existing "glow-fuel" models.

For many years, sailplanes and other hand-launched smaller model kits have been successfully modified for electric power. In recent times, with the improvement in motor- and battery-power technologies, larger single- and multi-engine sport and scale models have appeared on the scene. Many were scratch-built beauties by people who "grew up" with electrics. Others were highly modified "glow-powered" kits. To try to encourage more "glow" fliers to try electric and to incite fliers of smaller electric models to try larger models (those that will ultimately weigh 5 to 20 pounds), I'll discuss some of the techniques used and modifications implemented to create a good electric model from a kit intended for a reciprocating engine.



Altech* Pilatus Turbo Porter (ARC) with Modelair-Tech H-1000 belt drive (with an extension shaft). Only modification to kit was to make 48, 2-inch-diameter holes in heavy, fully sheeted foam wing. Flies with homemade, scale-diameter 3-blade 14x8 prop driven by a Graupner* Speed 700 (12V version) at 2.57:1; 152 oz.; 21, 1500mAh cells; 720 sq. in.; 30.4 oz./sq. ft. wing loading.

TECHNIQUES AND MODIFICATIONS

It's a fallacy that an electric-powered (EP) model airplane has to weigh more than a glow-powered (GP) model of a similar size. However, to weigh the same or less, the EP model must be designed as an electric from the start. GP models converted to electric will weigh slightly more when "electrified" unless considerable redesigning is done. Therefore, one should pick a subject to convert to electric that can be 5 to 10 percent heavier without sacrificing performance. To that end, general-aviation models (high- and low-wing Pipers, Cessnas and Aeroncas) and larger-wing sport models (Stiks, Kadets and many other lightly built trainers of the '60s, '70s and '80s that are still available today as kits) have made, and will continue to make, good EP models without extensive redesign.

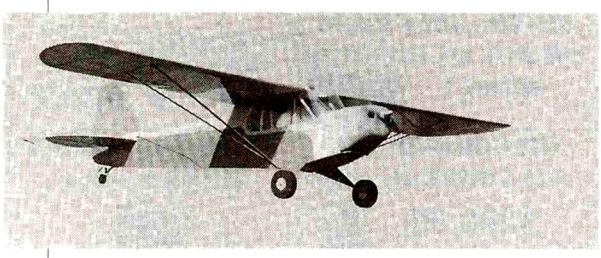
TYPICAL MODIFICATIONS

• **Fuselage.** Most GP models are structurally over-designed in the fuselage when considered for EP. These models must take the constant pounding of a reciprocating engine for their entire useful lives. To be durable, they require more plywood. Also, most manufacturers increase strength more than necessary to ensure that the structure won't fail, even if abused by a modeler. This added plywood accounts for the most weight that can be removed from the model when it's converted to EP.

How you mount your electric motor (and gearbox or belt drive, if used) determines the new combination of plywood/hardwood/balsa that will be used to secure this powerplant. Typically, when the motor system is beam mounted (on hardwood rails), you can use lite-ply instead of birch plywood for the firewall. If the motor is cantilevered (supported by a bracket) directly on the firewall, use thinner birch ply (half the thickness, down to a minimum of 1/8 inch for models with up to 16 cells, and 1/4 inch minimum up to 32 cells).

Inside the fuselage, many models have heavy plywood doublers running from the firewall to just behind the wing. These doublers can be made out of thinner plywood (I use no thicker than 1/64-inch ply doublers on all models with 10 to 32 cells). Alternatively, lightening holes can reduce the wooden surface area to nearly half.

If they do not already have lightening holes, lite-ply bulkheads (other than the firewall) can be replaced with balsa ones. Landing-gear mounts can be lightened somewhat by reducing the thickness of the hardwood or plywood. You could also drill lightening holes, but remember, landing

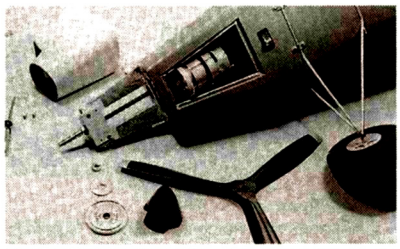


In the air, the Nosen* PA-11 looks so "real" that a few people wondered where the pilots were! Modifications include removal of some plywood in the landing-gear and firewall areas; 260 oz.; 2,000 sq. in.; 18.72 oz./sq. ft. wing loading; motor, gearbox and ratio: two 12V Speed 700s; Modelair-Tech, H-1000DP(SP); 3.0:1; 32, 1500mAh cells; 20x11 prop.

gear mounts still have to bear the weight of a slightly heavier model when the model is electric powered, so don't get too low in strength here.

Last, some provision for battery and motor cooling should be made. For the motor, small scoops cut into a vacuum-formed cowl are adequate. The air must be allowed to exit the cowl or continue through holes in the firewall, over the batteries and out through a hole in the aft part or lower part of the fuselage. A good rule-of-thumb for the size of these holes is 2 square inches of outlet for every 1 square inch of inlet. If the air must travel over or through many obstructions, a 3:1 ratio is more appropriate. Although it's true that the cobalt motors can take higher temperatures than the ferrites, if you cool your motor properly, you'll lengthen motor and brush life and increase system efficiency (longer flights).

• **Wings.** To save weight, I have seen too many people poke a thousand holes in the ribs of a built-up wing in a model that will weigh 6 to 9 pounds when complete. Even if the ribs are rock-hard balsa, this operation will probably save only an ounce or two. Do you really think that you can tell the difference between the way the model flies at 6 pounds, 9 ounces and at 6 pounds, 10.5 ounces? Don't waste your time; in fact, many built-up wings should be built "stock" from the kit because they may have to carry even more weight to fly as an electric. I have seen many people add a bay or two to sport models to "carry" that extra weight. Although it seems to be a good idea, that extra wing area means that more "Gs" can be pulled, and more load-carrying capability will have to be built into the wing root. Fiberglass taping of the wing center section or an additional plywood wing-spar joiner is always a good idea. Usually, the increased wing area makes up for the weight added to accomplish this task.



Pilatus Porter showing Modelair-Tech H-1000 belt drive and extension shaft. Note that the prop-shaft bearing support (behind prop adapter) is bolted to the original glow-engine, hardwood mounting beams. Scale-diameter, 3-blade prop; hatch allows access to belt drive from below; scale chin scoop feeds cooling air to the motor through a hole in the lower part of the firewall.

Flight performance is improved for two good reasons:

• Drag is lowered because the wing has to produce less lift to support the model (during climbing and maneuvers, lift-induced drag accounts for nearly 50 percent of a model's total drag).

• The increased wingspan increases the "aspect ratio," and this also has the effect of reducing drag.

If the wings are constructed of sheeted foam, weight can be saved without sacrificing strength by reducing the amount of balsa (and glue) behind the airfoil's high point (see Figure 1). Using "capstrips" instead of fully sheeting the wing can result in a 2- to 4-ounce weight savings on a 600-square-inch wing. If the wing core is made of white polystyrene foam, there's no need to remove the foam between the capstrips. If the wing is pink or blue extruded foam, weight can be reduced by removing the foam between the capstrips.

If landing gear are installed in the wing (whether built-up or foam construction), do not attempt any modifications here. Install the hardwood according to the plans, and do not attempt any lightening around this structure.

If the wing has been pre-sheeted for you (some almost-ready-to-cover mod-

Figure 1. Modeler-built foam wing—weight-reduction mods.

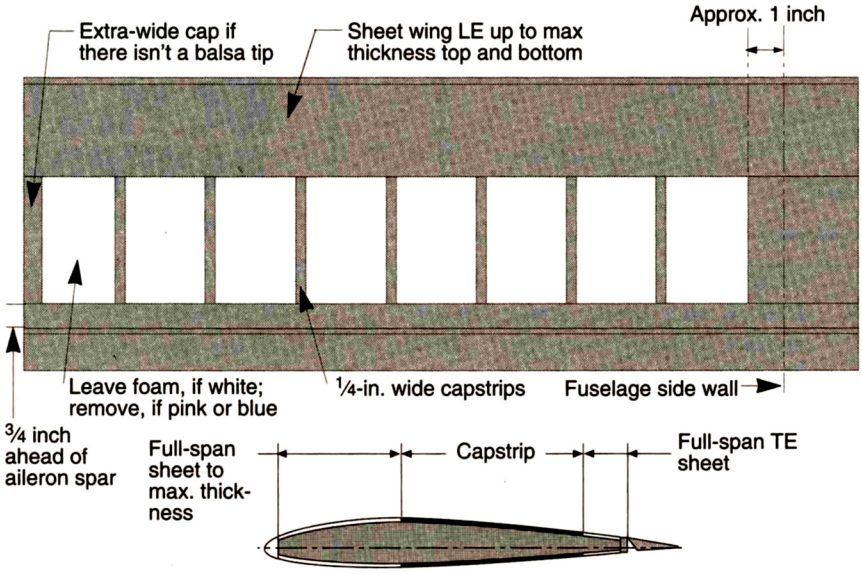
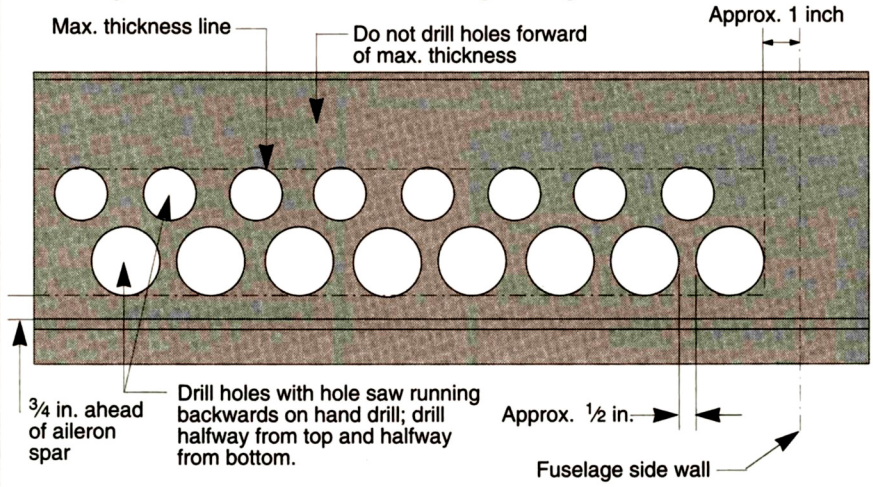


Figure 2. Pre-sheeted foam wing—weight-reduction mods.



els), you can cut large circular holes by running a 1- to 2-inch hole saw backwards on a hand drill. Enter the wing from both sides; don't cut through from one side, because the wood tends to splinter on the exit side. Space the holes about ½ inch apart, and don't cut out any material forward of the thickest part of the airfoil. Also, leave enough wood near the trailing edge to keep the aileron firmly attached (see Figures 1 and 2).

TAIL FEATHERS

If the balsa seems hard and heavy, the horizontal and vertical tails can be lightened with a lot of holes. A good, light-color, soft balsa need not be subjected to this operation because the weight savings will be minimal and strength may be compromised.

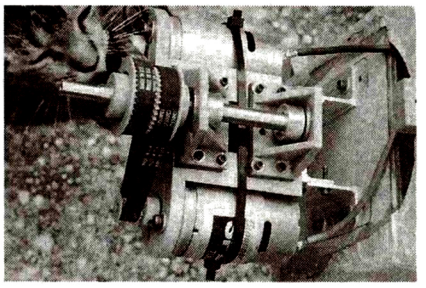
A built-up tail section of sticks rarely needs modification, but use a good hard piece just ahead of the elevator and rudder hinge line for strength. If the elevator halves are joined by wire, you may substitute thinner wire, because electric sport models generally fly more slowly than their glow relatives. For instance, on a 40-size trainer, a 3/32-inch-wire elevator joiner could be substituted for the ⅛-inch one; this weight savings, however, is again minimal.

The nice thing about EP models is that no matter how heavy the tail section gets, the fear of the model being tail-heavy should be almost nonexistent, because you have all that nickel-cadmium to move around to balance the model.

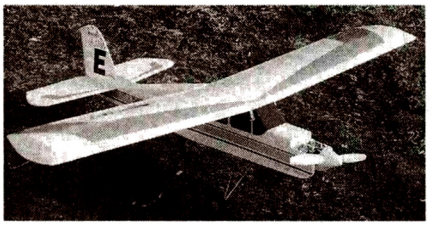
GENERAL NOTES ON WEIGHT SAVINGS

• **Don't over-use epoxy glues;** they're heavy and aren't always necessary. Do use them to join wings and to install firewalls and motor mounts and landing-gear blocks.

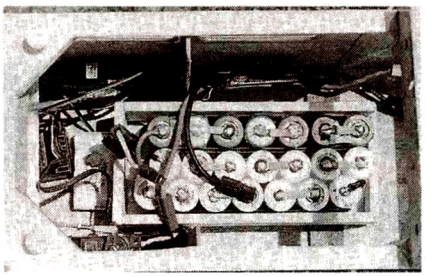
• **Use CA** as much as possible. Aliphatic-resin glue (e.g., Elmer's carpenters' glue) is very good if you aren't in a hurry or you're allergic to CAs. Use full-size servos (40 to 50 oz.-in. of torque, not micro- or miniservos) to guide these larger electric models. Although many new, small servos can produce the torque of some of the older, standard servos, the flight-control devices weigh a bit more because of their size. On hard landings, these heavier devices can damage the gear train of smaller servos.



Modelair-Tech* H-1000DP(SP) under the cowl of the author's ¼-scale Cub. Two motors belt-drive a common shaft to swing large props at low current drain and big thrust. "MJ" is looking for lunch in the wrong place!



Aerocraft* "Recruit E" with Amp-Air* dual 05 gearbox. Thinner wing ribs and a change to tail-dragger configuration were the modifications. Conversion package available from Aerocraft with or without Amp-Air gearbox. Two motors drive a common output shaft; 16, 1500mAh cells; 104 oz.; 780 sq. in.; 19.2 oz./sq. ft. wing loading.



Twenty-one 1400mAh cells and a 12V Graupner Speed 700 drive the Pilatus through the air swinging a 14x8, 3-blade prop. The hard, ¼-inch-thick sheet-balsa battery box is glued to the floor beams under the wing. This massive fuselage has plenty of room for all the other radio equipment; an FX-35 provides motor speed control.

• **Consider putting an aileron servo in each wing.** You'll be surprised that the extra weight of a second servo is offset by the absence of pushrods with 90-degree bellcranks and heavy 3/32-inch cable-wire pushrods. With EP models approaching ⅕ and ¼ scale, use "¼-scale" servos (100+ oz.-in.). Pull-pull cables to these devices (elevators/rudders) can be considerably lighter than stout, solid pushrods.

• **Install a receiver battery pack.** Some electronic speed controls (ESCs) capable of handling more than 14 cells have battery-eliminator circuitry (BEC). Their manufacturers rarely recommend the use of this feature beyond 12 cells of input. To drop the voltage from 14+ volts to 5.2 volts for the receiver would be quite a task (electrically), and a lot of heat would be expended from the ESC. Therefore, a receiver battery pack must be installed in the model. In even my largest models, I use the 275mAh variety, mainly because I can charge these packs safely at the field on either my SR* Smart Charger or my Astro* 110D charger. The extra weight of this size of battery gets lost in a 6- to 10-pound model.

• **Use iron-on coverings.** They are still the best, most durable/repairable covering materials available. Any "name brand" will do. Applied to a 6- to 9-pound model, the difference in weight between them is probably in the order an ounce or two. The covering is available in many bright colors and military colors, as is matching paint for cowls, wheel pants, etc. Because there's no need for fuelproofing, you don't have to coat the motor compartment heavily with fuelproofing materials. You can also use any commercially available enamel spray paint; it's light and dries very quickly.

• **Use lightweight wheels and other related hardware.** Now offered by many model manufacturers, these offer fliers a way to save a few ounces.

WRAPPING UP

In conclusion, when the proposed GP to EP conversion model is expected to weigh between 6 and 20 pounds (14 to 36 cells' input), weight-saving techniques should not influence the strength of the model. Poking lots of holes in balsa may net you only a 1- to 2-percent reduction in the weight of the final vehicle and, in some cases, will adversely affect its strength and/or durability. Standard radio equipment (or larger) should and can be used. Take advantage of all the available lightweight off-the-shelf hardware. Don't try to make it yourself because the time expended may save you only an ounce or two.

Next time, I'll offer some easy-to-use guidelines for picking power systems for these models (prop/motor/reduction ratio choices), but be aware that if you are serious about electric model flight there are two pieces of equipment you must have: a tachometer and an ammeter. If you don't have them, get them; I'll explain their importance next time. Send e-mail to *thunt95147@aol.com.*

**Addresses are listed alphabetically in the Index of Manufacturers on page 131.*

MODEL AIRPLANE NEWS PRODUCT REVIEW

Inexpensive intro to R/C

S.G. Corp. Radio

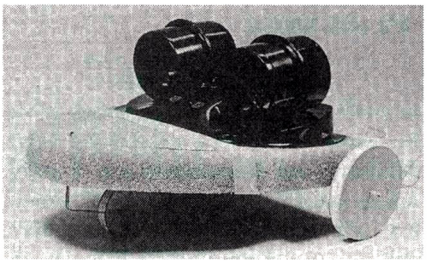
by CLYDE GEIST

HERE'S a complete, 2-channel radio system that costs just $12.95! S.G. Corp's.* 27MHz system receiver has two built-in motor controls and includes two micro motors and props as well. At first glance, it looks like the blimp power unit it was no doubt intended to be; but in practice, it's a most effective educational tool for the entire family.

And what lessons will this radio provide? For very little additional cost, your family will soon build model cars, boats, blimps and airplanes. You will better understand the fundamentals of R/C and aerodynamics. You will learn alongside your kids as you build projects that suit your particular skill levels, and you'll do it without adversely affecting the family budget.

FAMILY R/C

I have the S.G. radio on my kitchen table, complete with fresh batteries. It works, but it doesn't fly—not without some help. It's time to build some stuff. I have lots of ideas, but this radio is for indoors—close range. I'll confine my projects to what



The Styrofoam trike-geared air car.

flies close and slowly—something that can be built quickly and costs very little.

After lots of planning, I decide to eliminate building and designing altogether, and I buy a Styrofoam, toy-store glider. Any Styrofoam glider with a 3- to 4-foot wingspan should work. As a contrast, I also want the best possible test-bed vehicle to experiment with the radio. I decide to build a newer, stronger version of a recent and successful indoor model of my design, the "Slow Hand." (Plans and building notes available from Air Age Publishing—FSP04962; see Pilots' Mart.)

An idea page included with my radio package depicts various simple construction projects that might appeal to younger participants. With all the experience I've had, I recommend three Ni-Cd cells (3.6 volts) and a capacity of from 50 to 250mAh. The radio also works with a 3V lithium battery or, for the best performance in all projects, it can handle up to five Ni-Cds.

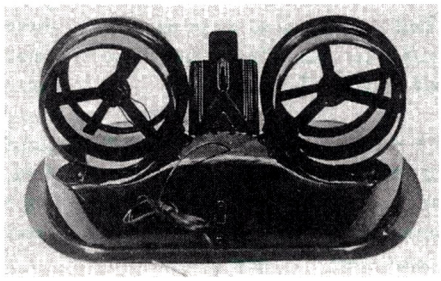
Suitable first projects:

• **Air car.** Mount the S.G. receiver unit on the top of a foam-slab trike-geared air car. Build it by looking at the picture, and make sure the wheels spin independently.

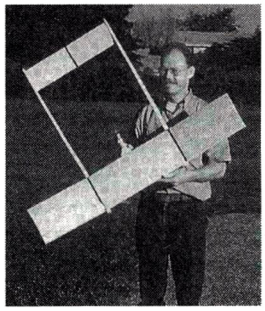
• **Bleach-bottle boat**—for the basics crowd, and it's a better performer. Just screw on a shaped wooden keel with 4 ounces of lead taped to the side (to be the bottom) of a 1-gallon plastic container, cut out the top, and attach the receiver unit to the opening. This arrangement is great for a swimming pool or any small pond. To experiment, frame up a simple boat or use a plastic toy. The motors from the radio could drive two small props installed on the transom.

• **Blimp**—basic aircraft, and also conveniently offered in kit form by S.G. Corp. blimps are easy to make and super easy and safe to fly indoors.

All these projects and more can be made to operate with the S.G. Corp. radio, some store-bought accessories and some home-brewed hardware.



Receiver unit, including motors and props.



The author with his Slow Hand canard. The second version was a little heavier and could be flown outdoors.

SLOW HAND

My original indoor electric model—Slow Hand—was intended to turn with the use of rudder, but at slow speeds, the rudder was ineffective and the model refused to turn. During test glides, I actually forced it into turns with my hand (hence its unusual name). I epoxied the two motors to the tips of an extended motor stick and wired them to the centrally mounted S.G. receiver

RADIO SPECIFICATIONS

• Transmitter

No. of channels: 2 (two, two-position sticks)
Frequency: 27.145MHz (legal for air and ground)
Power: 9V transistor battery

• Receiver

Weight (bare): ¼ oz.
Power req'd: one 3V lithium or 3- to 5-cell Ni-Cd
Max. range: 75 to 100 feet (indoors)
Features: when out of range, radio shuts props off.
Motor specs: white dot on motor is negative (-)

Battery	Volts*	mAh	Watts
3V lithium	2.3	300	0.70
3-cell Ni-Cd	3.1	500	1.55
4-cell Ni-Cd	4.2	800	3.35
5-cell Ni-Cd	5.5	1.4	7.70

*Measured under load

SLOW HAND SPECIFICATIONS

Main wingspan: 50 in.

Main wing area: 400 sq. in. (50 x 8 in. chord)

Canard wingspan: 20 in.

Canard area: 100 sq. in. (20 x 5 in. chord)

Total area: 500 sq. in.

Weight (airframe): 98 gm. (3 oz.)—
Hi-Line Mini-6 motor (0.5 oz.), fuselage (23 gm.), canard (12 gm.), wing (63 gm.—covered with cellophane food wrap).

Weight—motor battery (110mAh): 1 oz.

Total weight: 5.85 oz. (airframe, radio and battery). The original was substantially lighter.

Cost to build: $20 (ready to fly)

and battery. I now have a removable R/C module that successfully makes the craft turn. For primary power, I mounted a Hi-Line* Mini-6 airplane motor on a balsa pod that extends forward from the wing center section.

With 500 square inches of area (combined wing and canard) and a flying weight of 6 ounces, the wing loading is only 2 ounces per square foot, so flying speeds of 8 to 10mph are the norm. Control is similar to that of the blimp: right stick forward for left turn.

The Comet glider is hand-launched; note the four pods and two motors under the wing.

Because turns are accomplished by adding thrust, there's no loss of altitude. But get this! Cross control, and this vehicle turns on a dime, although a 10-foot altitude loss accompanies it. The turning thrashers can both be switched forward to help the plane climb faster, or they may be reversed to bring it down fast. Normal turns are within a 15-foot radius, and flights of 2 minutes with four, 110mAh cells can be expected.

When flying this model, having a background in R/C does not help, so you and your child will succeed when you learn to fly it together. It's almost crash-proof! In fact, Slow Hand is the best indoor model I've ever flown. My second version is heavier and stronger, so flights outdoors, in very calm air, add to the fun.

To find the appropriate CG, before each test glide, add nose weight until the stall ceases; then mark the CG. Next, experiment with powered free-flight by gluing (with epoxy) one S.G. motor and prop onto the end of a ¼x¼-inch balsa stick. Mount it on the boom fuselages, span-wise, with rubber bands, and wire it electrically to your primary battery. Adjust your turn radius by moving the thruster motor inward or outward (more or less to one side).

Second, the S.G. radio control could be introduced by wiring the two outboard "jets" to it, thereby allowing you to steer it. Finally, the S.G. control could be adapted to switch the motors on and off on one channel and to steer by means of rudder on the other.

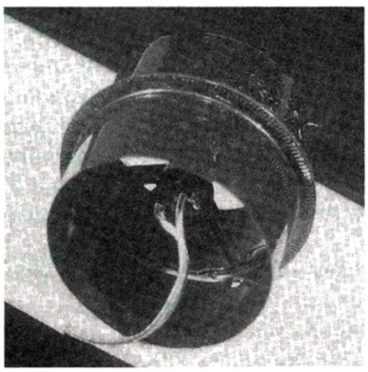
To prepare your particular foam glider, begin by adjusting it for the best glide and marking the CG's position somewhere on the wing. I used my home-made foam cutter to hollow out the nose section (to reduce weight) and to hollow out the wing to seat the battery pack. Ready to fly, the craft weighs 5 ounces. Double-sided tape holds the thrusters (jet pods) to the wing bottom, and masking tape holds the 24-gauge (R.S. 278-1301) wires to the wing's trailing edge. Make sure that each motor thrust line is parallel to the fuselage center line. Mounted with Velcro®-brand fastener, the battery can be shifted fore and aft to make subtle changes to the CG.

To experiment, I attached two motors (removed beforehand from the blimp's receiver unit) to the underside of the wing, and I powered them with five, 110mAh Ni-Cd cells. The resulting flight was disappointing.

Next, I improved the motor pods' thrust by trimming the flanges off the leading and trailing edges and most of the protrusions off the inside walls and adding two motors (total of four). This resulted in almost level flight. Finally, I added two Hi-Line Micro-4 motor pods with pusher props to make a total of six thrusters; this gives 1 to 2 minutes of gentle climbing left circles. There's no prop torque to consider, so trimming for power and glide is the same. You have to hear this thing! Its sound is indescribable.

COMET GLIDER

Recommended for all those who are more than 14 years old, this inexpensive, readily available toy offers the greatest potential for a variety of projects incorporating the S.G. system. For example, it flies free-flight gliders with six thrusters used as "jet" power.



Power pod on Styrofoam wing.

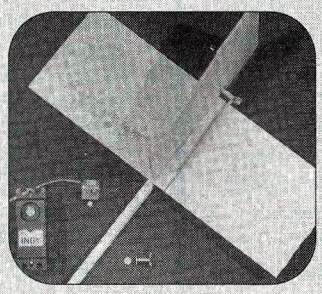
• **R/C conversion.** I wired the outer two motors to the radio control. The same 5-cell packs feed both the four inner motors and the radio; total additional weight is only 1.5 ounces. When I push the radio sticks forward, it climbs; with both motors off, it levels out; one motor on and it turns

Homemade accessories

• **Wire cutter** to cut Styrofoam.

• **Actuator for rudder.** This requires a wire coil from a Radio Shack relay (no. 275-243) and two magnets (Radio Shack, 64-1895). The power requirement is 100mA at 5 volts; their pull is light, but effective for rudders up to 5 square inches.

• **Modified servo.** Open the back of an old servo, remove the circuit board, and wire it directly to the motor. Five cells can provide enough power to steer cars, boats and a slow plane, but remember, automatic centering is disabled.



Standard servos can be modified with servo options. The Ceto actuator, magnet and coil to build the actuator, and fin showing the memory-wire hook-up are shown, too. (See the sidebar for this application.)

• **Memory-wire actuator.** In practice, this 0.004-inch-diameter wire-like material stretches about 10 percent of its length. Apply power (about 1 amp at 3 volts) to 6 inches of it, and it immediately shrinks to its original length, pulling with more force than a full-size servo; and it weighs almost nothing.

Aftermarket accessories

• **Ceto* servo.** It operates a 1.5-square-inch rudder for single-channel operation. For 2-channel operation, another servo will control the elevator.

Aftermarket additions expand the S.G's capabilities.

• **Relay.** Used with 5 cells, the Radio Shack 275-243 allows the control of more powerful equipment, i.e., 12W motors, modified big servos and memory-wire actuators.

• **Speaker wire**—24-gauge for motor hook-up, or memory-wire actuator (Radio Shack 278-1301).

• **Rectifier**—Radio Shack 276-114. Wire one in series with any motor to eliminate reverse or forward motor response.

away from it. Out of range? The radio motors go off, and a safe free-flight automatically results until the model is back in range.

BLIMP PROJECT

I ordered the Double Blimp kit—a package that includes plans, instructions and fabric to make any two blimps. To build the blimps without adult supervision, you should be at least 14 years old, but flying can start as young as five.

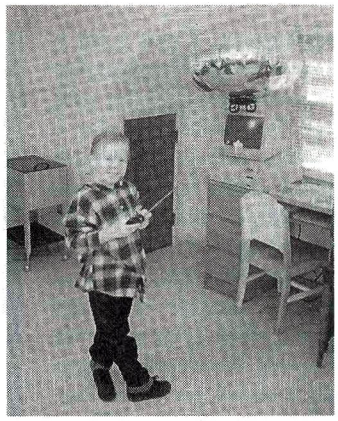
First, I had to choose which one(s) to build; five versions are shown in the instructions. The instructions begin with a simple rectangular "pillow" blimp; next, there's a round saucer, a delta-wing glider and a two-sided or four-sided conventionally shaped blimp (the most advanced).

Battery options.

To gain the most varied experience, I chose the saucer, because it's easy to build, flies horizontally and looks great. Second, for the challenge, I chose the two-sided blimp because it's easier to assemble than the four-sided unit, it can lift the same 2.6 ounces, and it flies vertically.

The instructions are quite clear, and the results have proven to be satisfactory. Blimp construction begins with cutting out the plan and positioning it over two thicknesses (back to back) of the metallic Mylar. I used a razor blade to cut roughly about 1 inch outside the plan. A household iron is used to heat-seal the halves together, and then the outline is neatly trimmed to within ½ inch of the plan.

The instructions advise that you buy a tank of helium locally; I had mine filled at the local "party shop" for just $5. The helium only keeps the blimp buoyant for about two weeks. Somehow, it seems to escape, although I'm told this is not necessarily a sign of a leak. When the blimp is filled with helium, to prevent it from hitting the ceiling, it carries a full ballast of lead shot in a pouch attached to the antenna. I remove some of the lead every day, and I also re-ballast to suit the environment, e.g., a warmer room.



The author's son with the saucer version of the blimp kit.

Flying is a lot of fun as long as it's indoors. The thrusters face aft and slightly downward. When both thrusters are powered forward, the blimp climbs. This is accomplished by ballasting the blimp to sink very slowly when it isn't powered.

The saucer is very sensitive to control-turn input and is better for small spaces, but the blimp shape is directionally stable and better for youngsters than the saucer. I've flown mine at home, at work, at the club meeting, in a school gym and in a large hangar. The greatest challenge is having proper ballast; the flying seems natural, and everyone wants a turn!

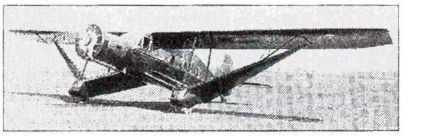
The S.G. Corp. supplies a blimp and/or radio package at a bargain price, but what you do with them is up to you. The projects, ideas and accessories presented here are by no means the only possibilities. I can only tell you where to start: with a $12.95 R/C system from S.G. Corp.

**Addresses are listed alphabetically in the Index of Manufacturers on page 131.*

Name THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?

If you can, send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897-3035.



CONGRATULATIONS to Joseph Staats of Oklahoma City, OK, for correctly identifying the January '96 mystery plane. The Bellanca Aircruiser (circa 1932) was a later version of the Bellanca Airbus and featured the same sesquiplane wing structure. The top wing had an undercambered airfoil, and its bottom plane had a coarse anhedral that extended from the fuselage to the wheel pant. An airfoil bracing strut extended from the wheel pant to the aft wing-strut attachment on the underside of the wing. The Aircruiser could accommodate a pilot and 11 to 14 passengers, and there was a mail and baggage compartment forward of the cockpit. The top wing was made of wood, and the rest of the airframe was steel tube; the entire airframe was fabric-covered. The Aircruiser had a wingspan of 65 feet. When powered by the Wright Cyclone or the Pratt & Whitney Hornet engine, it was 42 feet, 9 inches long; with the geared Curtiss Conqueror, it was 40 feet, 8 inches long. The Aircruiser was a commercial success as a land and sea passenger plane, and it was also used by the U.S. Army Air Corps and the Cuban Air Force in the mid-'30s. Thanks to all who wrote in; good luck next month!

The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to *Model Airplane News*. If already a subscriber, the winner will receive a free one-year extension of his subscription.

Club of the MONTH

Westchester Radio Aero Modelers Inc.

56 Chadwick Rd., White Plains, NY 10604

WESTCHESTER Radio Aero Modelers (WRAM) has launched an aviation outreach program that will include school programs, demonstrations, data on the Internet and subsidized teaching aids.

WRAM spokesman Hank Nielsen comments, "We have the disturbing perception that fewer kids are interested in the exciting field of aviation today. Since we know the benefits of a full-time career in the field, as well as the lifelong recreational and educational benefits of modeling, we wanted to do something positive."

Club members thought that the "Hat in the Ring" symbol—Uncle Sam throwing his hat into the ring during WW I—first used by the 94th Fighter Squadron, accurately characterized their goal, which is to foster enthusiasm for aviation and modeling in today's youth. The club asked Lt. Col. Miller—the current commander of the 94th—for permission to use the symbol. He responded, "I have many fine examples of America in my squadron—whether they fix 'em or fly'em. Your efforts may be enough to stimulate the next Eddie Rickenbacker or John Levitow."

Hank Nielsen notes that, with R/C airplane modeling, children can have fun while learning about measurements, math, materials, powerplants, aerodynamics and controls. We agree, and we are proud to wish WRAM—our club of the month—much success in their endeavor.

INDEX OF MANUFACTURERS

Ace R/C Inc., 116 W. 19th St., P.O. Box 472, Higginsville, MO 64037-0472; (816) 584-7121; fax (816) 584-7761.

Advanced Scale Models, 7 Lakewood Dr., Richmond, Ontario, Canada K0A 2Z0; (613) 838-4290.

Aerocraft, P.O. Box 553, E. Northport, NY 11731; (516) 754-6628.

Aerospace Composite Products, 14210 Doolittle Dr., San Leandro, CA 94577; (510) 352-2002; fax (510) 352-2021.

Aeroworks, 27 S. Nome, Aurora, CO 80012; (303) 367-9792.

Air Champ Models Inc., 801 S.W. 3rd Ave., 3rd Floor, Miami, FL 33130.

Airtronics Inc., 11 Autry, Irvine, CA 92718; (714) 830-8769.

Altech Marketing, P.O. Box 391, Edison, NJ 08818-0391; (908) 248-8738.

Amp-Air, 42A Nancy St., West Babylon, NY 11704; (516) 253-2702.

APC Props; distributed by Landing Products, P.O. Box 938, Knights Landing, CA 95645; (916) 661-6515.

ASP; distributed by Hobby Lobby Intl., 5614 Franklin Pike Cir., Brentwood, TN 37027; (615) 373-1444; fax (615) 377-6948.

Astro Flight Inc., 13311 Beach Ave., Marina Del Rey, CA 90292; (310) 821-6242; fax (310) 822-6637.

Avonds; distributed by Aeroloft Designs, 130 W. Hampton, Ste. 20, Mesa, AZ 85210; (602) 649-8662.

B²Streamlines, P.O. Box 976, Olalla, WA 98359-0976.

Balsarite; distributed by Coverite (see address below).

Balsa USA, P.O. Box 164, Marinette, WI 54143; (800) 225-7287; fax (906) 863-5878.

Bob Banka's Scale Model Research, 3114 Yukon Ave., Costa Mesa, CA 92626; (714) 979-8058.

Bob Holman Plans, P.O. Box 741, San Bernadino, CA 92402; (909) 885-3959; fax (909) 889-9307.

Bob Parkinson Flying Models, 1140 Early Dr. NW, Palm Bay, FL 32907.

Bob Violett Models (BVM), 170 State Rd. 419, Winter Springs, FL 32708; (407) 327-6333.

Byron Originals, P.O. Box 279, Ida Grove, IA 51445; (712) 364-3165; fax (712) 364-3901.

California Soaring Products, 1010 N. Citrus, Covina, CA 91722; (818) 966-7215; fax (818) 966-7915.

Century Jet Models Inc., 11216 Bluegrass Pky., Louisville, KY 40299; (502) 266-9234; fax (502) 266-9244.

Cermark Electronics, 107 Edward Ave., Fullerton, CA 92633; (714) 680-5888; fax (714) 680-5880.

Ceto; distributed by Hobby Lobby Intl., 5614 Franklin Pike Circle, Brentwood, TN 37027.

Cogswell Engineering, 2379 Weatherwood Rd., Corona, CA 91719; (909) 735-8679.

Coverite, 420 Babylon Rd., Horsham, PA 19044; (215) 672-6720; fax (215) 672-9801.

Dave Brown Products, 4560 Layhigh Rd., Hamilton, OH 45013; (513) 738-1576; fax (513) 738-0152.

Davis Model Products, P.O. Box 141, Milford, CT 06460; (203) 877-1670.

DGA Designs, 16 Main St., Phelps, NY 14532.

Direct Connection R/C; distributed by Capstone R/C Suppliers, 562 W. Schrock Rd., Westerville, OH 43081; (614) 899-6313; fax (614) 899-6070.

Don Smith Plans, 219 Goolsby Blvd., Deerfield Beach, FL 33442; (305) 570-7551.

Du-Bro Products, P.O. Box 815, Wauconda, IL 60084; (708) 526-2136; fax (708) 526-1604.

Dynaflite, P.O. Box 1011, San Marcos, CA 92069.

Dynamax; distributed by Jet Model Products, 211 N. Mullen Rd., Belton, MO 64012; (816) 331-0356.

Falcon Model Works, 3623 Upton Ave. N, Minneapolis, MN 55412.

Frank Tiano Enterprises (FTE), 15300 Estancia Ln., W. Palm Beach, FL 33414; (407) 795-6600.

Futaba Corp. of America, P.O. Box 19767, Irvine, CA 92713-9767; (714) 455-9888.

Global Hobby Distributors, 10725 Ellis Ave., Fountain Valley, CA 92728; (714) 964-0827; fax (714) 962-6452.

Graupner; distributed by Hobby Lobby Intl., 5614 Franklin Pike Cir., Brentwood, TN 37027; (615) 373-1444; fax (615) 377-6948.

Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-1104.

Hansen Scale Aviation, 10807 S.E. Stacey Ct., Portland, OR 97266.

Hi-Line, P.O. Box 11558, Goldsboro, NC 27532.

Hobbico/Great Planes Model Distributors (see Great Planes address above).

Hobby Lobby Intl., 5614 Franklin Pike Cir., Brentwood, TN 37027; (615) 373-1444; fax (615) 377-6948.

HobbyPoxy, 36 Pine St., Rockaway, NJ 07866; (201) 625-3100; fax (201) 625-8303.

Hobby Shack, 18480 Bandilier Cir., Fountain Valley, CA 92728-8610; (800) 854-8471; fax (714) 962-6452.

Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511.

ISC Intl., 10620 N. College Ave., Indianapolis, IN 46240; (317) 846-0766; fax (317) 848-1015.

JBK Products, P.O. Box 7409, Huntsville, AL; (409) 293-1212.

JMP (Jet Model Products), 211 N. Mullen Rd., Belton, MO 64012; (816) 331-0356.

Jomar Products, 3440 Riverhills Dr., Cincinnati, OH 45244; (513) 271-3903.

JR Remote Control; distributed by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511.

J'Tec, 164 School St., Daly City, CA 94014; (415) 756-3400.

K&B Mfg., 2100 College Dr., Lake Havasu City, AZ 86403; (520) 855-7901; (520) 855-5930.

K&S Engineering, 6917 W. 59th St., Chicago, IL 60638; (312) 586-8503; fax (312) 586-8556.

Kyosho/Great Planes Model Distributors (see Great Planes address above).

Lesher Model Aviation, 330 Rexmont Rd., Lebanon, PA 17042-8445; (714) 272-2616; fax (717) 272-0481.

Magnum; distributed by Global Hobby Distributors (see address above).

Major Hobbies, 1520 "B" Corona Dr., Lake Havasu City, AZ 86403; 800-625-6772, (602) 855-7901; fax (602) 855-5930.

Master Airscrew; distributed by Windsor Propellor Co., 3219 Monier Cir., Rancho Cordova, CA 95742; (916) 631-8385; fax (916) 631-8386.

MAT Products, P.O. Box 145, Wood Ridge, NJ 07075.

McCoy Racing, 1778 Albright Ave., Upland, CA 91786.

Model Tech; distributed by Global Hobby Distributors (see address above).

Midwest Products, P.O. Box 564, Hobart, IN 46342-0564; (800) 348-3497.

Modelair-Tech, P.O. Box 12033, Hauppauge, NY 11788-0818; (516) 979-1475.

Moki; distributed by Gerard Enterprises Inc., W226 N825 Eastmound Dr., Waukesha, WI 53186; (414) 521-0547; fax (414) 521-0551.

Mondo Electronics Inc., 524 San Anselmo Ave. #107, San Anselmo, CA 94960.

MonoKote; distributed by Great Planes Model Distributors (see address above).

Nelson Aircraft Co., 21550 N.W. Nicholas Ct., Unit D, Hillsboro, OR 97124; (503) 629-5277; fax (503) 629-5817.

Nick Ziroli (see Ziroli Plans).

Nosen; distributed by A&A Industries, P.O. Box 244, Sibley, IA 51249; (712) 754-3930; fax (712) 754-4671.

O.S. Engines; distributed by Great Planes Model Distributors (see address above).

Pacer Technology, 9420 Santa Anita Ave., Rancho Cucamonga, CA 91730.

Peck Polymers, P.O. Box 710399 MB, Santee, CA 92072.

Pica-Robbe Inc., 2655 N.E. 188th St., Miami, FL 33180.

Precision Aviation Design, 1822 6th Ave W, Bradenton, FL 34205.

Proctor Enterprises, 25450 N.E. Eilers Rd., Aurora, OR 97002; (503) 678-1300; fax (503) 678-1342.

Pro-Mark, 751 Airport Rd., Metropolis, IL 62960; (618) 524-2440.

Rhom-Air, 8936 S.W. 129th Ter., Miami, FL 33176; (305) 232-6615; fax (305) 232-6818.

R/C Air Models, 562 W. Schrock Rd., Westerville, OH 43081.

R/C Soaring Digest, P.O. Box 2108, Wylie, TX 75098-2108; (214) 442-3910; fax (214) 442-5258.

Robart Mfg., P.O. Box 1247, 625 N. 12th St., St. Charles, IL 60174; (708) 584-7616; fax (708) 584-3712.

Robinaire, 7386 Seabreeze Dr., Lake Worth, FL 33467; (407) 439-6965.

S.G. Corp., 1780 E. Chase Ave., El Cajon, CA 92020.

Sig Manufacturing Co. Inc., 401 S. Front St., Montezuma, IA 50171; (800) 247-5008 (order only); fax (515) 623-3922.

Slegers Intl., Rt. 15, Wharton, NJ 07885; (201) 366-2525; fax (201) 366-0549.

Slimline Mfg., P.O. Box 3295, Scottsdale, AZ 85271; (602) 967-5053; fax (602) 967-5030.

SR Batteries Inc., P.O. Box 287, Bellport, NY 11713; (516) 286-0079; fax (516) 286-0901.

Stream R/C Models, P.O. Box 1113, Newport News, VA 23601-0113; (804) 591-0720.

SuperTigre; distributed by Great Planes Model Distributors (see address above).

TAGS, 2787 Stage Center Dr., Memphis, TN 38134.

Telestar Video, 1501 S.E. Decker Ave., Ste. 109, Stuart, FL 34994.

Testor Corp., 620 Buckbee St., Rockford, IL 61104; (815) 962-6654; fax (815) 962-7401.

The Birdworks, P.O. Box 1320, Port Orford, OR 97465; (503) 332-0194.

Top Flite; distributed by Great Planes Model Distributors (see address above).

Top Gun Aircraft, 801 Canal St., Wing A, Ottawa, IL; (800) 380-5387.

Tower Hobbies, P.O. Box 9078, Champaign, IL 61826-9078; (800) 637-4989; (800) 637-7303.

Tru-Turn Presicion Model Products, P.O. Box 836, South Houston, TX 77587; (713) 943-1867.

Viking Models USA, 2 Broadmoor Way, Wylie, TX 75098; (214) 442-3910; fax (214) 442-5258.

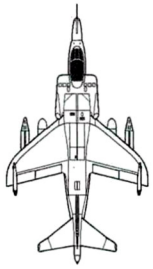
Webra; distributed by Horizon Hobby Distributors (see address above).

Yellow Aircraft, 203 Massachusetts Ave., Lexington, MA 02173; (617) 674-2222; fax (617) 674-2188.

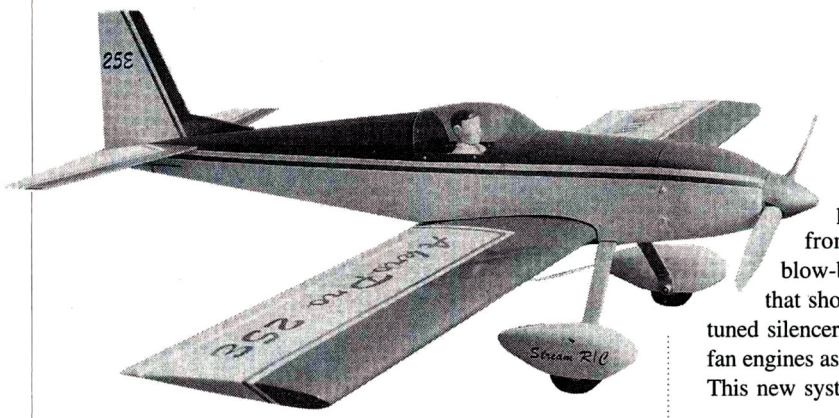
Zap; distributed by Pacer Technology (see address above).

Zinger; distributed by J&Z Products, 25029 S. Vermont Ave., Harbor City, CA 90710.

Ziroli Plans (Nick Ziroli), 29 Edgar Dr., Smithtown, NY 11787; (516) 467-4765; fax (516) 467-1752.



LATEST PRODUCT RELEASES



STREAM R/C MODELS

Stream Akro Pro-25E

Stream R/C Models has a sleek new electric-powered design that has outstanding maneuverability and stability. It has a fully symmetrical airfoil, a 42-inch wingspan and 410 square inches of area. The AP-25E is designed to use the MEC Turbo Plus and a 10-cell pack, and it has a flying weight of only 64 ounces. The 4-channel kit features: a formed landing gear; ABS cowl and wheel pants; clear canopy; selected die- and machine-cut balsa, plywood and hardwood parts; full-size rolled plans; and detailed instructions. The catalogue is $1.

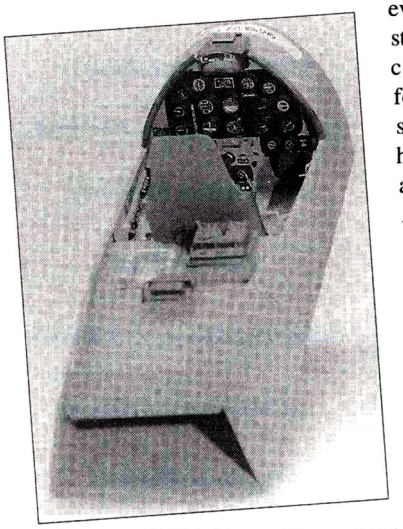
Price—$89.95

Stream R/C Models, P.O. Box 1113, Newport News, VA 23601-0113; (804) 591-0720.

BOB DIVELY MODELS

Scale Accessories

BDM makes some of the finest scale cockpit interiors for more than 25 types of models, and more are being made every month. The light, strong, easy-to-assemble cockpits are "vacu-formed" of .030 polystyrene sheets and have crisp details that are second to none. All cockpit kits come with instructions and instrument and placard decal sheets. BDM's most recent interior is for the Top Flite P-40, and the Midwest AT-6 interior is on the way. Pilot figures are also available.

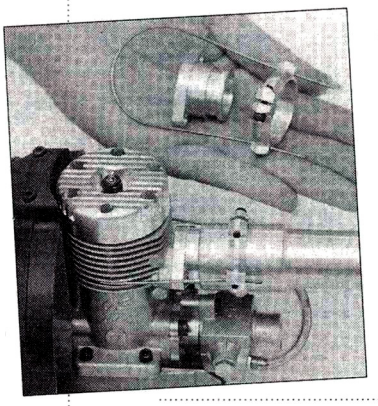


Bob Dively Models, 38131 Airport Pkwy. #206, Willoughby, OH 44094; (216) 953-9254; fax (216) 953-9311.

BOB VIOLETT MODELS

BVM Pipe Retainer and O.S. .91 Exhaust Adapter

This retainer system keeps your tuned silencer pipe attached to the engine and prevents the pipe from rotating. It ensures absolute retention with no blow-by of exhaust gases, and it comes with instructions that show you how to use the retainer with existing BVM tuned silencer pipes. It can be used with O.S. and K&B ducted-fan engines as well as the BVM .91; special tools are not required. This new system still uses two Viton "hot seal" O-rings, so you can expect to get 40-plus flights from a single mounting. BVM also offers a matched exhaust adapter for the O.S. .91 engine that's CNC-machined out of bar-stock aluminum.



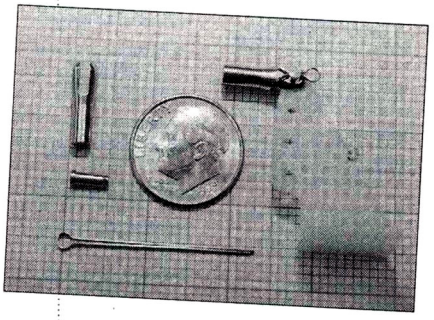
Part nos.—5855 (BVM pipe retainer), 6017 (O.S. .91 exhaust adapter); **prices**—$27.50, $25.

Bob Violett Models Inc., 170 State Rd. 419, Winter Springs, FL 32708; (407) 327-6333; fax (407) 327-5020.

NELSON AIRCRAFT CO.

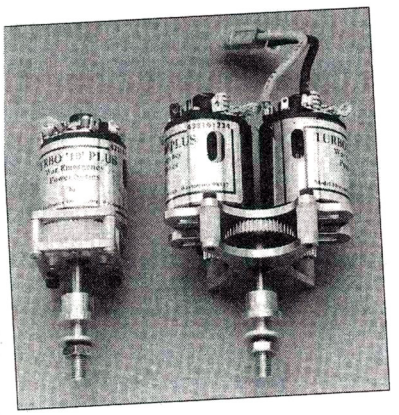
Subminiature Scale Clevis Ends

Available in an adjustable version with a 2-56 thread and a fixed version with a 1/32-inch-diameter hole, these clevises are approximately 1/2 inch long. The slot width is 1/16 inch, and the clevis pin diameter is 0.079 inch (5/64 inch or #47). The nickel-plated, steel clevises feature a scale-like removable clevis pin that's held in place with a 1/32-inch cotter pin. They're strong and can take any linkage (including push, pull, or pull/pull wire/-cable control systems) or flying wire flight loads encountered on any size R/C model. The adjustable clevis features a precision 2-56 thread that can be adapted to common rod ends; the fixed version has a 1/32-inch, full-length hole for 1/32-inch wire or cable (soldering required). You get two assemblies per bag (adjustable or fixed), two clevis pins and two 1/32-inch cotter pins.



Prices—$5.95/pair (adjustable), $5.50/pair (fixed), plus $3 S&H.

Nelson Aircraft Co., 21550 N.W. Nicholas Ct., Unit D, Hillsboro, OR 97124; (503) 629-5277; fax (503) 629-5817.



MODEL ELECTRONICS CORPORATION

Dual Box

The "Super Box" now has a big brother—the "Dual Box," which allows you to double the power of your electric motor system. Dual Box has a compact, light, ball-bearing-equipped gearbox that allows two motors to power a large, efficient propeller. You can improve the thrust of inexpensive motors by doubling them up. Two "Turbo 10 Plus" motors, used with a Dual Box, can provide a high level of performance with excellent duration, which is great when flying large models. Ratios of 3:1 all the way up to 8:1 are available. Catalogues are $3.

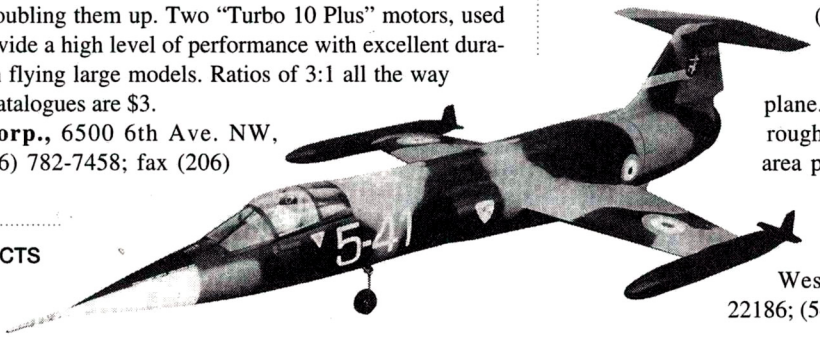
Model Electronics Corp., 6500 6th Ave. NW, Seattle, WA 98117; (206) 782-7458; fax (206) 782-9199.

MUD DUCK AVIATION

Mud Duck

This giant, now available in kit form, is made almost entirely out of light, tough FoamCor board and requires no covering; the smooth surface is ready to paint. The plane weighs just under 14 pounds, and it flies well with a .60 2-stroke, although a .91 4-stroke is recommended. With a 108-inch wingspan and three channels (no ailerons), it flies like a slow, gentle trainer and has the attitude of a bush plane. Its giant tires are great for rough terrain, and the large wing area permits STOLs. It's inexpensive and can be built quickly.

Mud Duck Aviation, 7118 Westmoreland, Warrenton, VA 22186; (540) 347-1134.



JD MODEL PRODUCTS

F-104 Starfighter

This 1/9-scale, ducted-fan fighter features a one-piece, 100-percent-epoxy fuselage and factory-glassed foam wings. All the formers are precut and router-finished, and the fuselage is pre-painted in a white finish. The fuselage also has detailed panel lines and precut access hatches, and both the tractor and pusher versions have an access hatch etched into the top of the fuselage. The Starfighter comes with tip tanks and a detailed scale cockpit, and it can be set up with retracts. The tractor version has the appropriate intake ducts and formers and costs about $40 more than the pusher version. The tractor version was flown at the Texas Fan Fly. With a 42-inch wingspan, the 78-inch-long Starfighter requires a .80- to .90-size engine. Send $2 for a catalogue.

Price—$499.95 (pusher version) plus S&H.

JD Model Products, P.O. Box 386, Pacifica, CA 94044; (415) 359-0406.

ACE R/C

Digipulse™ Multi-Charger

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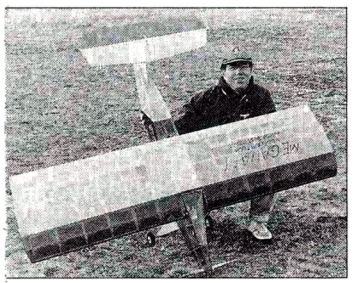

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WANTED: ignition model engines 1930s to 1950s, especially Elf, Baby Cyclone, Brown Jr., Ohlsson Custom and Gold Seal. Also model racecars, any parts, spark plugs, etc; Woody Bartelt, 3706 North 33rd, Galesburg, MI 49053; (616) 665-9693, or (800) 982-5464. [4/96]

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EVENTS

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CORONA, CA, MAIN EVENT SHOW—2180 Nevada; April 26, 27, 28; Friday 5:00 p.m. - 10:00; Saturday & Sunday 10:00 a.m. - 5:10 p.m.; Free admission; (909) 371-4451. [4/96]

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TOM'S DAWN PATROL

Tom and his WW I scale models (clockwise from top): Pfalz D.IIIa, Phönix D.I, Albatros D5A, Bristol Scout D and Morane Saulnier Parasol A-I. All use four channels—throttle, rudder, ailerons and elevator.

Specifications

Albatros D5A
Engine: Saito 1.20 4-stroke
Wingspan: 72 in.
Weight: 12 to 13 lb.
Finish: Coverite, fiberglass, Latex paint

Morane Saulnier A-I
Engine: Zenoah G-23 gas
Wingspan: 84 in.
Weight: 14 lb.
Finish: Coverite, Sig dope

Phönix D.I
Engine: O.S. .90 4-stroke
Wingspan: 72 in.
Weight: 10 lb.
Finish: Coverite, Sig dope

Bristol Scout D
Engine: Enya .60 2-stroke
Wingspan: 48 inches
Weight: 7 lb.
Finish: Coverite, Sig dope

Pfalz D.IIIa
Engine: O.S. 1.20 4-stroke
Wingspan: 74 in.
Weight: 14 lb.
Finish: Coverite, Sig dope

THIRTY-YEAR-OLD Tom Polapink of Centereach, NY, has been building model airplanes for most of his life. When he was young, his father took him to see WW I airplanes fly at the Old Rhinebeck Aerodrome in Rhinebeck, NY. This had a profound influence on him and inspired him to build R/C model replicas of what he saw.

Tom searched out full-size WW I airplanes at the Smithsonian Air Museum, the U.S. Air Force Museum in Dayton, OH, and many other repositories of vintage aircraft across the nation. Needless to say, the Old Rhinebeck Aerodrome was, and still is, his destination on countless trips.

Tom has flown his superbly detailed scale models at many contests. His work has earned him awards in top nationwide competitions, such as the Scale Masters (placed in the top 10 and won Best Military Airplane), and Top Gun (High Static Expert, Best Biplane and Best Scratch-Built Scale). Several of his outstanding miniature airplanes have also appeared in television shows and commercials.

Tom uses traditional construction methods and builds most of his models with balsa and plywood, and he finishes them with Coverite* and custom-mixed Sig* dope. He spends approximately eight months on drawing the plans and then scratch-building a plane. For reference, he uses sources such as Wylam's plans, museums and libraries. His craft are distinguished by authentic details, right down to wing-rib spacing, instrument panels and cockpit controls. The colors and insignia on his WW I airplanes are also historically accurate. All his models have scale-like undercambered airfoils and most use scale pull/pull cable control for rudder and elevator.

Tom says there are probably still more than 100 WW I airplanes he still wants to model, and the model he likes to fly most is his Pfalz D.IIIa. If you have ever considered building and flying WW I models, let Tom's Dawn Patrol help inspire you.

—Frank Gudaitis

A beautiful study of the Albatros D5A in 1/5 scale. Coverite (on the wings), fiberglass cloth (fuselage)and latex paint add up to a stunning effort.

All Tom's models, such as this 1917 Albatros D5A, have detailed cockpits; insturments and switches, stick, pedals and interior details are all in evidence. Outside of the cockpit, the model is also alive with details such as rib stitching, functional rigging wires and turnbuckles.